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13. ABSTRACT *(Maximum 200 words)*

This environmental assessment (EA) is an analysis of the environmental consequences of conducting activities in support of the Navy LEAP Technology Demonstration. The analysis demonstrates that no significant impacts to the environment will occur as a result of implementing the proposed action.

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Navy Lightweight Exoatmospheric Projectile (LEAP) Technology Demonstration

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Navy Lightweight Exoatmospheric Projectile (LEAP) Technology Demonstration

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Environmental Assessment

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Abstract

The National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR Parts 1500-1508), and the U.S. Department of Defense (DoD) Directive 6050.1 direct that decision-makers account for environmental consequences when authorizing or approving major Federal actions. This environmental assessment (EA) is an analysis of the environmental consequences of conducting activities in support of the Navy (LEAP) Technology Demonstration.

The purpose of the technology demonstration is to identify and address key technology issues involved with incorporating miniature interceptors into a tactical weapon system (i.e., surface-to-air ship launched missile systems). These integrated technologies will be used to demonstrate the feasibility of performing high altitude ballistic missile defense from a Navy platform. To support these requirements, the proposed action involves integration and testing of Navy LEAP demonstration technologies, including the LEAP Launch Vehicle (STANDARD Missile (SM)), LEAP projectile, and advanced solid axial stage (ASAS) axial propulsion motor. Component assembly of the SM, LEAP projectile, and ASAS will occur at various engineering contractor facilities in the United States. Preflight and flight tests will occur at General Dynamics, Pomona, CA; White Sands Missile Range, NM; East Coast Navy Weapons Station, Charleston, SC; Atlantic Fleet Weapons Training Facility, U.S. Naval Station Roosevelt Roads, Puerto Rico; and Cape Canaveral Air Force Station, FL. The environmental analysis demonstrates that no significant impacts to the environment will occur as a result of implementing the proposed action.

Availability

Unclassified. Available September 1992.

Summary

Summary

The LEAP program is a Strategic Defense Initiative Organization (SDIO) interceptor technology development program aimed at successfully developing, integrating, and validating by experiment miniature Kinetic Energy (hit-to-kill) interceptors. These interceptors will have applications to ballistic missile defense. The LEAP program is run by the Interceptor Technology Directorate of the Technology Deputate within SDIO. Three integrating LEAP contractors are each developing similar yet unique designs for the LEAP interceptors. An incremental yet comprehensive approach to developing and testing LEAP technologies has been adopted to reduce risk, minimize cost, and produce early results which will be of use to weapons systems designers. The LEAP test program begins with early development testing of the components at contractor facilities and progresses to extensive ground testing at government facilities before final flight testing. The program has an on-going flight test program which is being performed with research boosters.

SDIO and the Navy have identified the need to demonstrate LEAP technologies in a mobile (ship-based) environment in the near term for potential applications in surface-based weapons systems. In order to perform this demonstration, SDIO proposes to use the STANDARD Missile (SM) and its associated launch platform with fire control system to accommodate ship-based launches of LEAP projectiles and technologies. The purpose of the Navy LEAP Technology Demonstration is to identify and address key technology integration issues involved with incorporating miniature, Kinetic Energy interceptors into a tactical weapon system (i.e., surface-to-air ship launched missile systems). These integrated technologies will be used to demonstrate the feasibility of performing high altitude (exoatmospheric) ballistic missile defense from a Navy platform.

The technology demonstration consists of fabrication, assembly, and ground tests at General Dynamics, Pomona, CA; Boeing Aerospace and Electronics, Kent, Washington; Hughes Aircraft Corporation, Canoga Park, CA; Rockwell International, Canoga Park, CA; and Thiokol Corporation, Elkton, MD. In addition, preflight and flight tests will occur at General Dynamics, Pomona, CA; White Sands Missile Range, NM; East Coast Navy Weapons Station, Charleston, SC; from a Terrier ship (guided missile cruiser or destroyer equipped with a Terrier missile system) at the Atlantic Fleet Weapons Training Facility (AFWTF), U.S. Naval Station Roosevelt Roads, Puerto Rico; and Cape Canaveral Air Force Station (CCAFS), FL. No construction will be required at any of these facilities to accommodate Navy LEAP activities, except for minor modifications (electrical work on the interior of Building 380) at U.S. Naval Station Roosevelt Roads.

One alternatives to the proposed action includes conducting equipment loading activities at East Coast Navy Weapons Station, Yorktown, VA., instead of Charleston, SC. Another alternative under consideration is using a solid propellant (instead of liquid propellants) for the LEAP projectile. Alternatives considered but not carried forward (no longer under consideration)

included the use of other surface-to-air missiles for the LEAP Launch Vehicle, alternative test ranges, alternative target launch vehicles, and the No Action alternative. The STANDARD Missile was chosen as the LEAP Launch Vehicle because the Navy has no other extended range surface-to-air missile with the performance capabilities to perform the Navy LEAP experiments in the near term.

Of the nine test ranges considered, AFWTF and CCAFS were selected because they meet range safety requirements, accommodate realistic mission scenarios developed by the Navy, accommodate launch scheduling flexibiiity, accommodate telemetry and mission control requirements, and provide necessary infrastructure to support LEAP technology requirements. Eight target launch vehicles were evaluated for their capability to meet LEAP requirements. Only the Aries I and II adequately meet the selection criteria. The Aries I can be maintained within a 2-3 km/second intercept velocity requirement (helps ensure ABM Treaty compliance) with minimal ballast. It also has the advantage of being a single-stage vehicle, which will lower mission risk and complexity.

The No Action alternative to the proposed action is to not develop and test a STANDARD Missile modified with LEAP technologies. The No Action alternative would preclude a series of flight tests that are needed to demonstrate the feasibility of using existing Navy shipboard weapon systems with LEAP technologies for high altitude ballistic missile flight.

Potential impacts of the proposed action at WSMR, U.S. Naval Station Roosevelt Roads, AFWTF, and CCAFS were conducted with respect to preflight and flight test activities and were assessed relative to the following environmental resources: physical setting and land use; water resources; geology and soils; biological resources; threatened and endangered species; cultural resources; air quality; noise; and hazardous materials and wastes. Infrastructure and human health and safety were also assessed. Potential impacts from the LEAP Test Program have previously been assessed in the LEAP Test Program Environmental Assessment (July 1991) and the LEAP Supplemental Environmental Assessment (June 1992). Each of these assessments resulted in a finding of no significant impact (FONSI). The environmental effects of STANDARD Missile tests at WSMR were assessed in the STANDARD Missile Environmental Assessment. This assessment also resulted in a FONSI. The analyses from each of these documents has been incorporated into this document by reference. The environmental analysis concluded that implementing the proposed action would not result in significant impacts to the natural environment or to human health and safety, at any of the aforementioned program facilities. This EA, and the information herein, is unclassified and available to the public.

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Description of Proposed Action and Alternatives 1.0

1.0 Description of Proposed Action and Alternatives

Section 1.0, Description of Proposed Action and Alternatives (DOPAA), presents a description of the Navy Lightweight Exoatmospheric Projectile (LEAP) Technology Demonstration. The technology demonstration is proposed by the Strategic Defense Initiative Organization (SDIO). This section presents a technical description of the proposed action, including the background and concept behind the demonstration, and a discussion of the alternatives, specifically as those alternatives relate to the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) Regulations implementing NEPA (40 CFR Parts 1500-1508).

The LEAP program is a SDIO interceptor technology development program aimed at developing, integrating, and validating by experiment miniature Kinetic Energy (hit-to-kill) interceptors. These interceptors will have applications to ballistic missile defense. The LEAP program is under the direction of the Interceptor Technology Directorate of the Technology Deputate within SDIO. Three integrating LEAP contractors are each developing similar yet unique designs for the LEAP interceptors. An incremental and comprehensive approach to developing and testing LEAP technologies has been adopted to reduce risk, minimize cost, and produce early results which will be of use to weapons systems designers. The LEAP test program begins with early development testing of the components at contractor facilities and progresses to extensive ground testing at government facilities before final flight testing. The program has an on-going flight test program which is being performed with research boosters and is described in the LEAP Test Program Environmental Assessment (EA) (Ref #1) and LEAP Supplemental EA (Ref 83#). These documents are incorporated in this EA by reference, with information summarized in this document where appropriate.

1.1 Purpose and Need for the Proposed Action

SDIO and the Navy have identified the need to demonstrate LEAP technologies in a mobile (ship-based) environment in the near term for potential applications in surface-based weapons systems. In order to perform this demonstration, SDIO proposes to use the STANDARD Missile (SM) and its associated launch platform with fire control system to accommodate ship-based launches of LEAP projectiles and technologies. The purpose of the Navy LEAP Technology Demonstration is to identify and address key technology integration issues involved with incorporating miniature, Kinetic Energy interceptors into a tactical weapon system (i.e., surface-to-air ship launched missile systems). These integrated technologies will be used to demonstrate the feasibility of performing high altitude (exoatmospheric) ballistic missile defense from a Navy platform.

1.2 Proposed Action

The Navy LEAP Technology Demonstration will consist of component/vehicle fabrication, assembly, and ground tests at several locations in the United States. Preflight integration, testing, and fueling activities of the SM and LEAP technologies will occur at White Sands Missile Range (WSMR), New Mexico; East Coast Navy Weapons Station, Charleston, South Carolina; and U.S. Naval Station Roosevelt Roads, Puerto Rico. These preflight activities will be followed by a series of flight tests consisting of four flight tests over open ocean within the jurisdiction of the Atlantic Fleet Weapons Training Facility (AFWTF), U.S. Naval Station Roosevelt Roads, Puerto Rico, and a fifth flight test involving an intercept over open ocean within the jurisdiction of Cape Canaveral Air Force Station (CCAFS), Florida. No construction will be required at any of these facilities to accommodate Navy LEAP activities, except for minor modifications (i.e., electrical upgrades to the interior of Building 380) at U.S. Naval Station Roosevelt Roads.

1.2.1 Program Description

The technologies to be used for the Navy LEAP program are described below, followed by a description of the component assembly/ground tests and relevant contractor facilities; preflight activities, including transportation of components and fueling operations; the five flight tests planned for the demonstration; postflight activities, including recovery, decommissioning, decontamination, and hazardous waste disposal; and ground and flight safety activities, including explosives ordnance handling, fuel handling, noise protection, launch and range control, and shipboard safety standards. Participants in the program and activity locations are illustrated in Exhibit 1.1.

1.2.2 LEAP Vehicle and Components

The SM will be used as the LEAP Launch Vehicle. The modifications to the SM for the Navy LEAP technology demonstration are described below in Section 1.2.2.1. In addition, the SM will incorporate a LEAP projectile and an advanced solid axial stage (ASAS) propulsion system, as described in Section 1.2.2.2. The Target Launch Vehicle is described in Section 1.2.2.4.

1.2.2.1 STANDARD Missile

The SM will be used as the LEAP Launch Vehicle. The SM was developed in the 1950s and is a supersonic, solid-rocket propelled, tail-controlled missile. It is deployed by the Navy, primarily as a surface-to-air ship-launched missile for defense against attacking aircraft and anti-ship missiles. Modifications of the SM are incorporated into the Tartar (designated SM-2 Medium Range (MR)) and Terrier (designated SM-2 Extended Range (ER)). The SM-2 also has been modified with Block II improvements, which improve guidance, ordnance, and propulsion capabilities of previous SM versions. The SM will be launched from a Terrier ship (a guided missile cruiser or destroyer equipped with a Terrier missile system).

Activity	Location	Activity Description
Component Assembly/ Ground Test Activities	General Dynamics Pomona, California	STANDARD Missile
	Boeing Aerospace and Electronics Kent, Washington	LEAP Projectile
	Hughes Aircraft Corporation Missile Systems Group Canoga Park, California	LEAP Projectile
	Rockwell International Rocketdyne Division Canoga Park, California	LEAP Projectile
	Thiokol Corporation Tactical Operations Elkton, Maryland	ASAS
Preflight Activities	General Dynamics Pomona, California	STANDARD Missile & LEAP/ASAS
	White Sands Missile Range (WSMR), New Mexico	STANDARD Missile & LEAP/ASAS
	East Coast Navy Weapons Station Charleston, South Carolina	STANDARD Missile & LEAP/ASAS
	Atlantic Fleet Weapons Training Facility (AFWTF)/U.S. Naval Station Roosevelt Roads Puerto Rico	STANDARD Missile & LEAP/ASAS
	Terrier Ship	STANDARD Missile & LEAP/ASAS
Flight Test and Postflight Activities	Atlantic Fleet Weapons Training Facility Puerto Rico	Flight Tests 1 - 5
	Cape Canaveral Air Force Station (CCAFS) Florida	Flight Test 5

Exhibit 1.1: Navy LEAP Technology Demonstration

The SM for the Navy LEAP Technology Demonstration will be the SM-2 Block II ER (referred to as the SM LEAP Launch Vehicle). The SM-2 Block II modifications will be conducted at General Dynamics, which will be responsible for the modification, fabrication, and checkout of the SM vehicle for each flight test (Ref #2, #14). This SM vehicle will consist of two configurations: Configuration A, which leaves the current warhead in place to serve as the flight termination system; and Configuration B, which replaces the warhead with the ASAS propulsion system and utilizes a new flight termination system (FTS). The two configurations are described below.

A. Configuration A

Configuration A of the SM will consist of two stages (Exhibit 1.2) and will not contain an actual LEAP projectile:

- 1st stage (a MK 70 mod 1 booster)
- 2nd stage (a MK 30 sustainer and missile front end)

The 1st stage will not require modification; however, the 2nd Stage will be slightly modified for flight tests 1-2. The modifications to the 2nd stage for flight test 1 include: replacing the existing pyro-ceramic radome with a nose cone of the same aerodynamic shape; adding an 18 inch cylindrical section aft of the nose cone; and adding ballasted weight to simulate the weight and center-of-gravity (CG) of the fully integrated LEAP/ASAS interceptor (Configuration B). The modifications to the 2nd stage for flight test 2 will include a retractable clam shell shroud (a nose cone that opens) in place of the nose cone in flight test 1, an 18 inch cylindrical section, LEAP ejection mechanism, a mock LEAP projectile, and an environmental telepak (measures the launch environment for the actual LEAP projectile). The mock LEAP will be constructed primarily of aluminum and will burn-up on reentry.

The SM will be fueled by aluminum (Al) with ammonium perchlorate (AP) as the oxidizer (Ref #8). The existing SM warhead will serve as the flight terminator by detonating in case of flight anomalies (Ref #8).

B. Configuration B

Configuration B will include an actual LEAP projectile and will consist of four stages (Exhibit 1.3):

- 1st stage (a MK 70 mod 1 booster)
- 2nd stage (a MK 30 sustainer and SM autopilot (battery section))
- 3rd stage (ASAS propulsion system, SM-2 guidance section, LEAP interface/support (LEAP interstage module), and LEAP shroud)
- 4th stage (LEAP projectile)

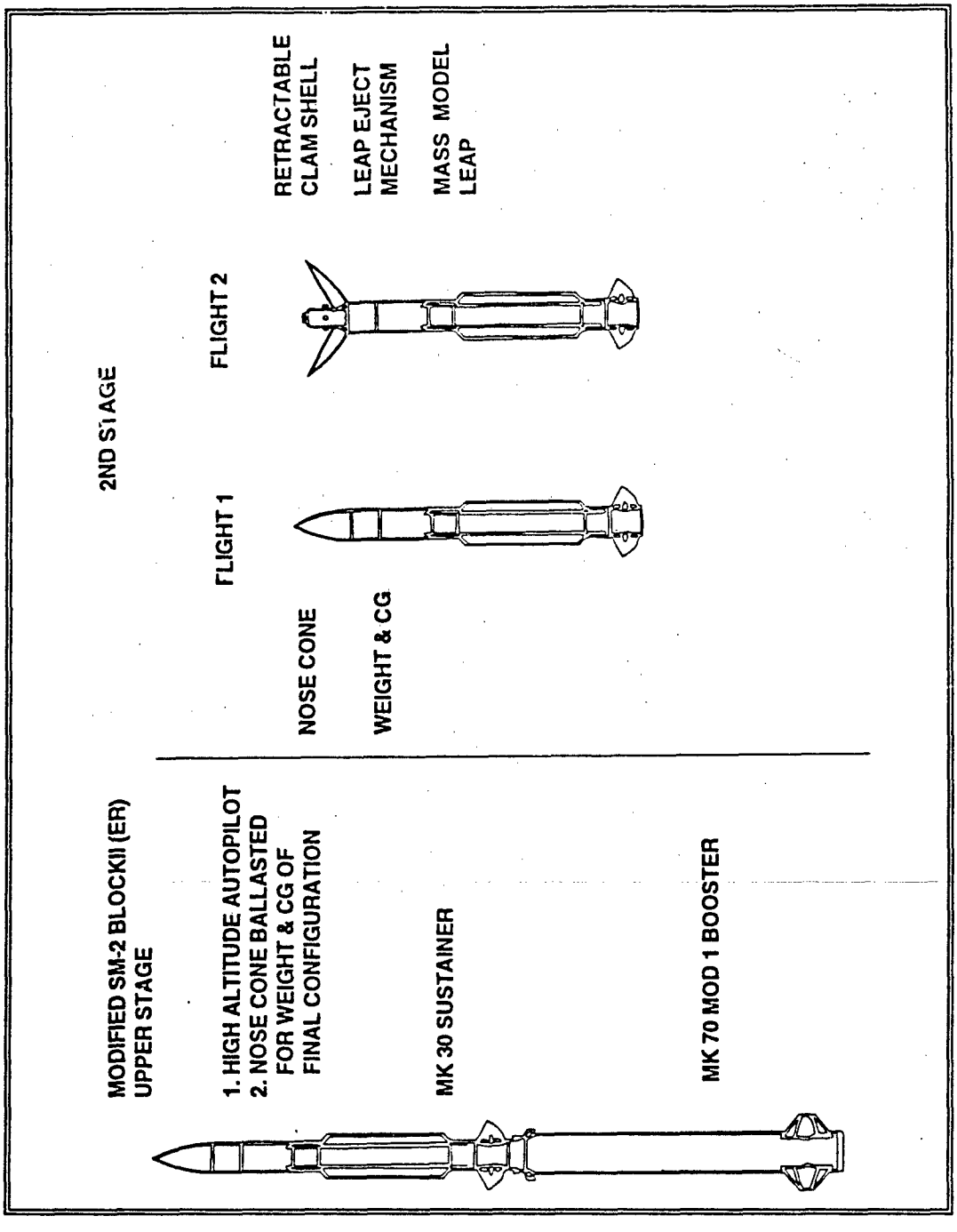

Exhibit 1.2: STANDARD Missile (Configuration A)
Source: SDIO, 1992.

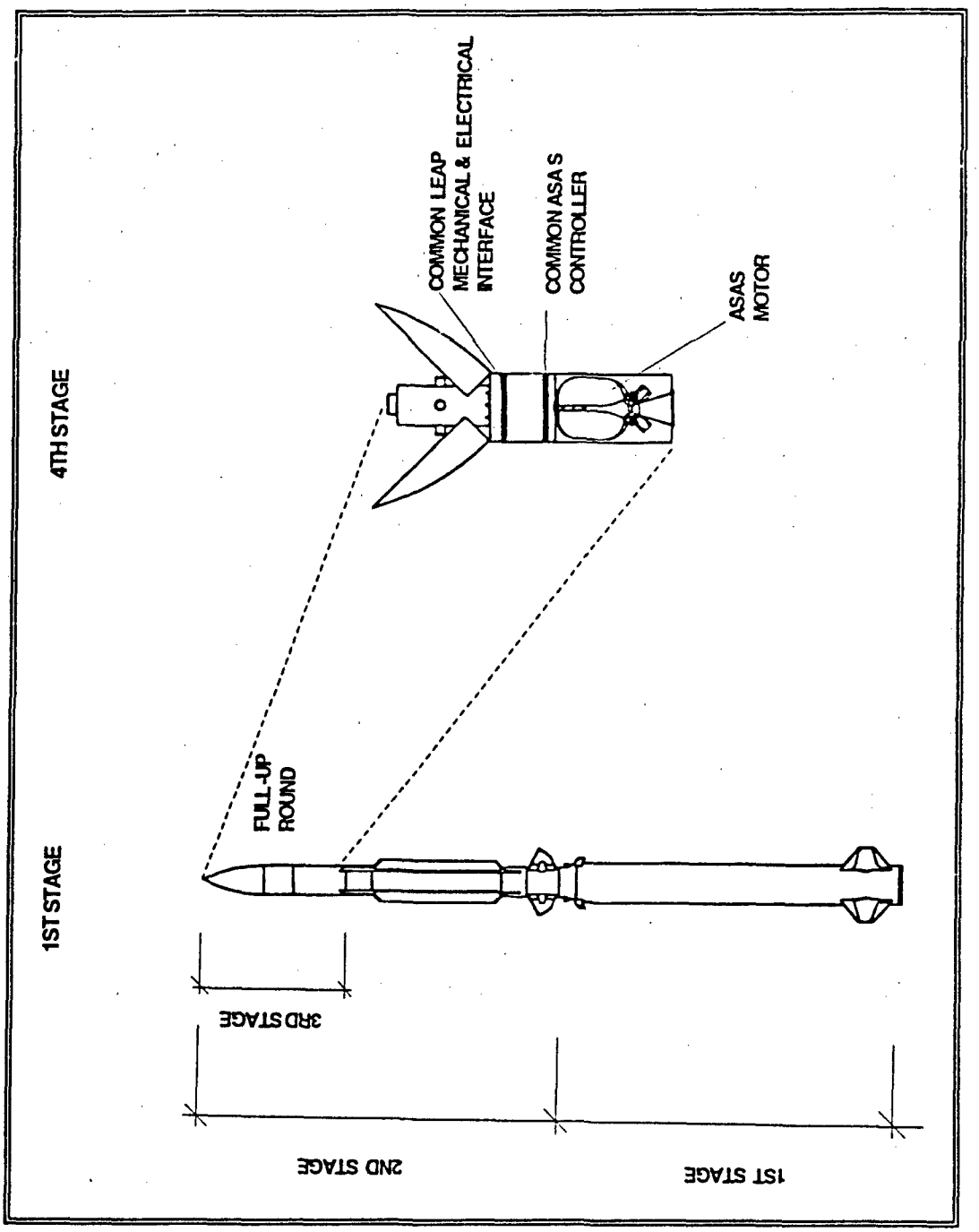

Exhibit 1.3: STANDARD Missile (Configuration B)
Source: SDIO, 1992.

The 3rd Stage of the SM LEAP Launch Vehicle includes an ASAS motor, an ASAS thrust vector control (TVC) system, a third stage separation device, and a cold gas attitude control system (ACS). The 4th Stage of the SM LEAP Launch Vehicle will consist of a LEAP projectile. In addition, a third/fourth stage command destruct system has been added to satisfy safety requirements. The command destruct system involves a flexible linear shaped charge for terminating the ASAS and the clam-shell separation mechanism. The SM fuels for Configuration B will be identical to Configuration A.

1.2.2.2 LEAP Projectile

A LEAP projectile will serve as the 4th stage of the SM LEAP Launch Vehicle (Configuration B). LEAP technology is being developed through two technological approaches for the LEAP Test Program. One approach is being coordinated by the U.S. Air Force through the Phillips Laboratory (PL), Edwards AFB, California; the second approach is being coordinated by the U.S. Army through the U.S. Army Strategic Defense Command (USASDC). Both approaches employ liquid bi-propellant engines in the LEAP projectile for divert maneuvering. The primary difference in the two approaches is the avionics technology applied to the LEAP projectile's sensor, guidance, stabilization, and control subsystems (Ref #1).

The SM LEAP Launch Vehicle will be modified to accommodate both approaches being developed for the LEAP projectile. The actual LEAP projectile for the Navy LEAP Technology Demonstration will be chosen based on the success of flight tests in the LEAP Test Program. Modifications to the SM for flight test 1 include an 18 inch extension in the upper stage front end to accommodate LEAP support equipment and simplify the integration of the LEAP projectile in subsequent flights. The SM for flight test 2 will be modified to include an aluminum mock LEAP projectile. The SM for flight test 3 will include a LEAP projectile with avionics; however, this projectile will not contain fuels, optics, or a propulsion system. The SM LEAP Launch Vehicle for flight tests 4-5 will include a fully integrated fueled and pressurized LEAP projectile. The liquid bipropellants for LEAP will consist of a maximum of 504 grams of hydrazine (N_2H_4) or monomethylhydrazine (MMH) as the fuel, and a maximum of 833 grams of nitrogen tetroxide (N_2O_4) as the oxidizer (approximately 1.4 liters or 3 pints of total propellant).

1.2.2.3 ASAS Propulsion System

The ASAS solid propellant rocket motor will serve as the axial propulsion system for final forward boost of the LEAP projectile in the 3rd stage of the SM LEAP Launch Vehicle (Configuration B). The ASAS will replace the warhead in the SM (Configuration A). The primary purpose of the ASAS will be to increase the LEAP projectile's kinetic energy by boosting the velocity of the LEAP projectile relative to the target.

The ASAS will be approximately 12.5 inches in diameter and 22.5 inches in length. When loaded with propellant, the approximate weight of the ASAS stage is 111 pounds. A missile FTS will be added to the motor for flight safety and will be a dual, redundant system with the capability to terminate the ASAS thrust and destabilize the flight of the complete missile. The

ASAS solid propellant will consist of an Al fueled, AP oxidized mixture. This propellant mixture weighs 74 pounds and is classified as a Department of Transportation (DOT) (49 CFR) Hazard Class/Division 1.3, Storage Compatibility Group B explosive.

1.2.2.1 Target Launch Vehicle

An Aries I or Aries II Launch Vehicle (Exhibit 1.4) will be used as the Navy LEAP Target Launch Vehicle for the flight test 5 target launch from CCAFS. The Aries I Launch Vehicle is a single-stage vehicle with the M56A1 Rocket Motor (which is also used as the Minuteman 1 Second Stage Rocket Motor). The Aries II Launch Vehicle is a two-stage launch vehicle. The first stage is an M56A1 Rocket Motor. The second stage is an M57A1 Rocket Motor (the M57A1 is also used as the Minuteman 1 Third Stage Rocket Motor).

The Aries I and Aries II Launch Vehicles were evaluated for use in the LEAP program in the LEAP EA (July 1991) and again in the Supplemental LEAP EA (June 1992). As stated in the LEAP EA, both the M56A1 and M57A1 Rocket Motors have high reliability. A complete alternatives analysis for using the Aries Launch Vehicles is presented in Section 1.4 of the LEAP EA. The analyses in the LEAP EA concluded that use of the vehicles for the LEAP program would not result in significant impacts to the environment.

1.2.3 Component Assembly/Ground Test Activities

To support the Navy LEAP Technology Demonstration, fabrication, assembly, and test activities for the SM, LEAP projectile, and ASAS will occur at General Dynamics, Pomona, California; Boeing Aerospace and Electronics, Kent, Washington; Hughes Aircraft Corporation, Missile Systems Group, Canoga Park, California; Rockwell International, Rocketdyne Division, Canoga Park, California; and Thiokol Corporation, Tactical Operations, Elkton Division in Elkton, Maryland. A description of contractor activities follows (Ref #23, #24, #27, #46, and #47).

1.2.3.1 STANDARD Missile (SM)

A description of the SM and modifications to be performed by General Dynamics for the Navy LEAP Technology Demonstration are summarized in Section 1.2.2.1.

General Dynamics — in Pomona, California will conduct design and systems integration tasks for the SM-2 Block II ER Terrier Missiles using proven technology. The modifications to the SM-2 will be performed according to General Dynamic's normal operating procedures for modifications to an engineering round (i.e., SM) and will be conducted within existing facilities (Ref # 23). These activities will be conducted through flight test 5.

After testing at General Dynamics, booster integration and test of the SM LEAP Launch Vehicle will be performed at WSMR, New Mexico.

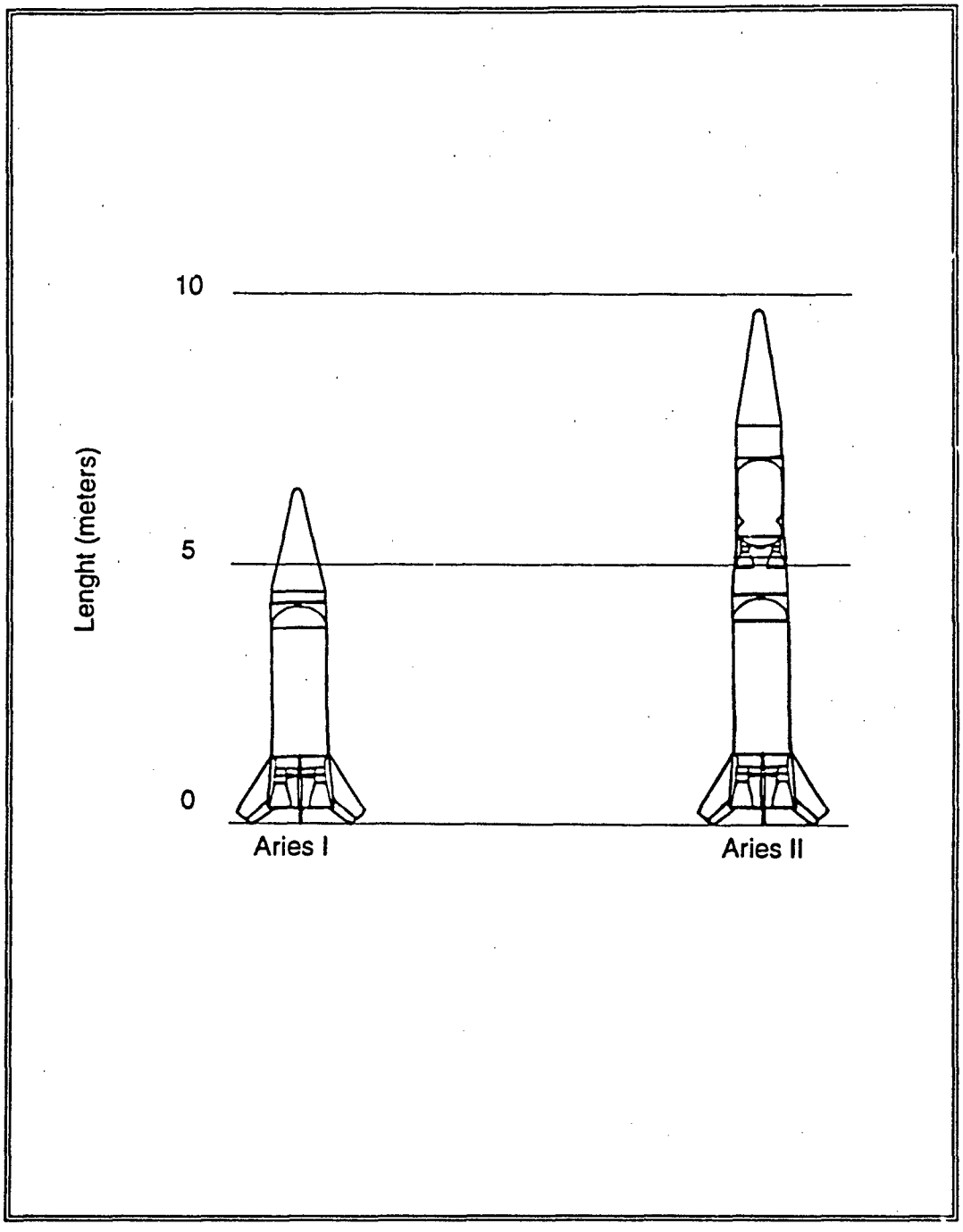

Exhibit 1.4: Target Launch Vehicle
Source: SDIO, 1992.

1.2.3.2 LEAP Projectile

A description of the LEAP projectile is located in Section 1.2.2.2. Existing contractors for the LEAP Test Program will be used for the Navy LEAP Technology Demonstration (exact contractor depends on which LEAP projectile is chosen). These contractors include Boeing Aerospace and Electronics; Hughes Aircraft Corporation, Missile Systems Group; and Rockwell International, Rocketdyne Division, as described below.

The Boeing Aerospace & Electronics Company (BAE) — located in Kent, Washington for the past 26 years, is a subsidiary of the Boeing Aircraft Corporation in Seattle. BAE will design and develop the LEAP vehicle and interstage module components at the Boeing Kent Space Center, which includes fabrication and assembly of hardware, software development and integration, and launch environment testing. Boeing will use proven technology.

Hughes Aircraft Company's (HAC) Missile Systems Group — will conduct integration and system level tests, component production, and assembly of technological products which are similar to those of the Space Test Projectile (STP) and LEAP Auxiliary Equipment (LAE). Component fabrication will occur at the Tucson, Arizona facility. Subsystem and system level integration and testing will occur at the Canoga Park, California engineering facility.

Rockwell International Corporation, Rocketdyne Division — will fabricate, assemble, and test LEAP vehicles and component hardware at its facility in Canoga Park, California. Specific activities will include fabrication of tankage, plumbing, thrusters, valves, avionics, and structures. Electronic and mechanical testing will also be conducted at the facility.

1.2.3.3 ASAS

A description of the ASAS is located in Section 1.2.2.3.

Thiokol Corporation, Elkton Division — has been located in Elkton, Maryland for the past 44 years. ASAS development began in 1988 and will support LEAP flight experiments. This facility will conduct ASAS motor design and development testing, using proven technology. The ASAS will use Al fueled, AP oxidized solid propellants. Numerous similar activities in the past have been conducted at this facility (i.e., Space Based Interceptor project). During chamber testing of the ASAS, any exhaust gases will be contained and recirculated through a water scrub system; thereby stripping Hcl from the gas. The scrub water, which is not volatile, will be sent off-site to certified facilities. All test activities will be in compliance with existing permits.

1.2.4 Preflight Activities

Preflight activities are planned to occur at General Dynamics, Pomona, California; WSMR, New Mexico; East Coast Navy Weapons Station, Charleston, South Carolina (Configuration A only); AFWTF, U.S. Naval Station Roosevelt Roads, Puerto Rico; and CCAFS. Preflight activities also

will be conducted on a Terrier ship. These activities will include transportation of vehicle components, equipment, and fuels from contractor facilities to the launch location; propellant fueling operations; and test activities at range facilities, as described below.

1.2.4.1 Transportation

A. SM (Configuration A)

The SM components (excluding ordnance) will be transported from General Dynamics to WSMR, New Mexico via commercial truck. From WSMR, the integrated SM will be transported to the East Coast Navy Weapons Station in Charleston, South Carolina in a MK-199 shipping container via commercial truck. At East Coast Navy Weapons Station the SM will be integrated with the booster, loaded onto a Terrier ship, and transported directly to the launch location within the AFWTF ALFA Range at Puerto Rico. This procedure is illustrated in Exhibit 1.5.

B. SM LEAP Launch Vehicle (Configuration B).

All non-ordnance components (including the LEAP projectile) will be delivered to General Dynamics from applicable contractor facilities for mechanical and electrical integration and system testing. Delivery will be performed by the respective contractors and via approved commercial transportation modes.

The LEAP projectile will be de-integrated from the SM components at General Dynamics and independently shipped to WSMR by the respective projectile contractor. Regardless of launch location, all components (including SM, LEAP, and ASAS) will be delivered to Building N300, Launch Complex 35 (LC 35) at WSMR, for integration and checkout of the entire SM.

Ordnance (i.e. the ASAS motor, sustainer motor, shape charges, initiators, etc.) will be transported to WSMR via commercial transport by the respective vendors. Thiokol will transport the ASAS in a Thiokol designed shipping container. All materials containing solid propellant or flight ordnance will be shipped in accordance with Bureau of Explosives (BOE) Tariff No. BOE-6000-1 and other applicable DoD and DOT regulations.

The container for the SM LEAP Launch Vehicle will be shipped from WSMR by air mobility command (AMC) flight and off-loaded at U.S. Naval Station Roosevelt Roads and transported to Building 380 until fueling operations and loading onto the Terrier ship. Fueling and integration operations will be conducted by Phillips Laboratory with Navy Weapons Department support. All loading and transportation procedures will be approved and certified by the Navy Weapons Systems Explosives Safety Review Board (WSESRB) prior to any operations. The fueled SM LEAP Launch Vehicle will be transported to the launch location by Terrier ship. This procedure is illustrated in Exhibit 1.6.

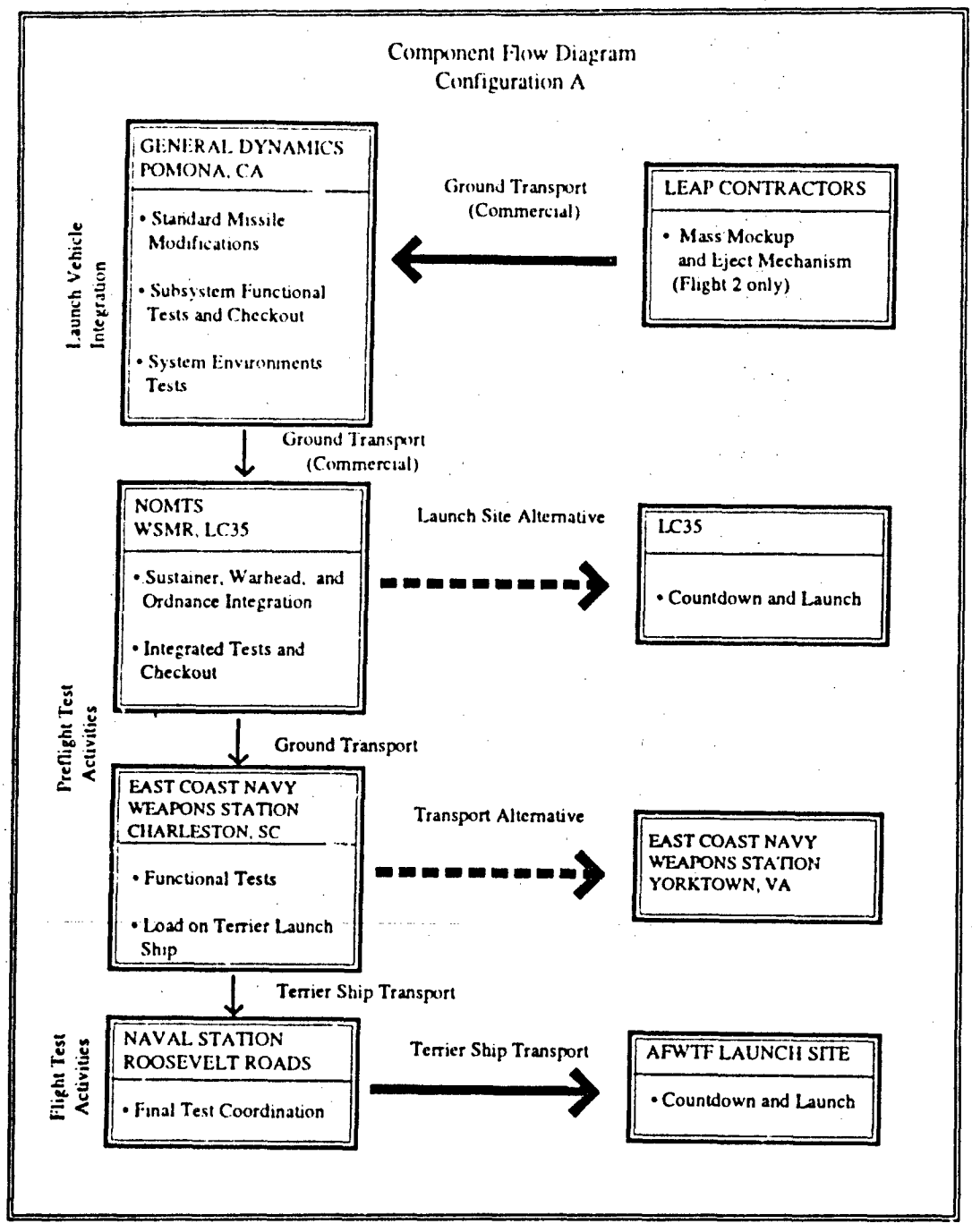

Exhibit 1.5: Configuration A Component Flow

Source: Louis Berger International, Inc., 1992.

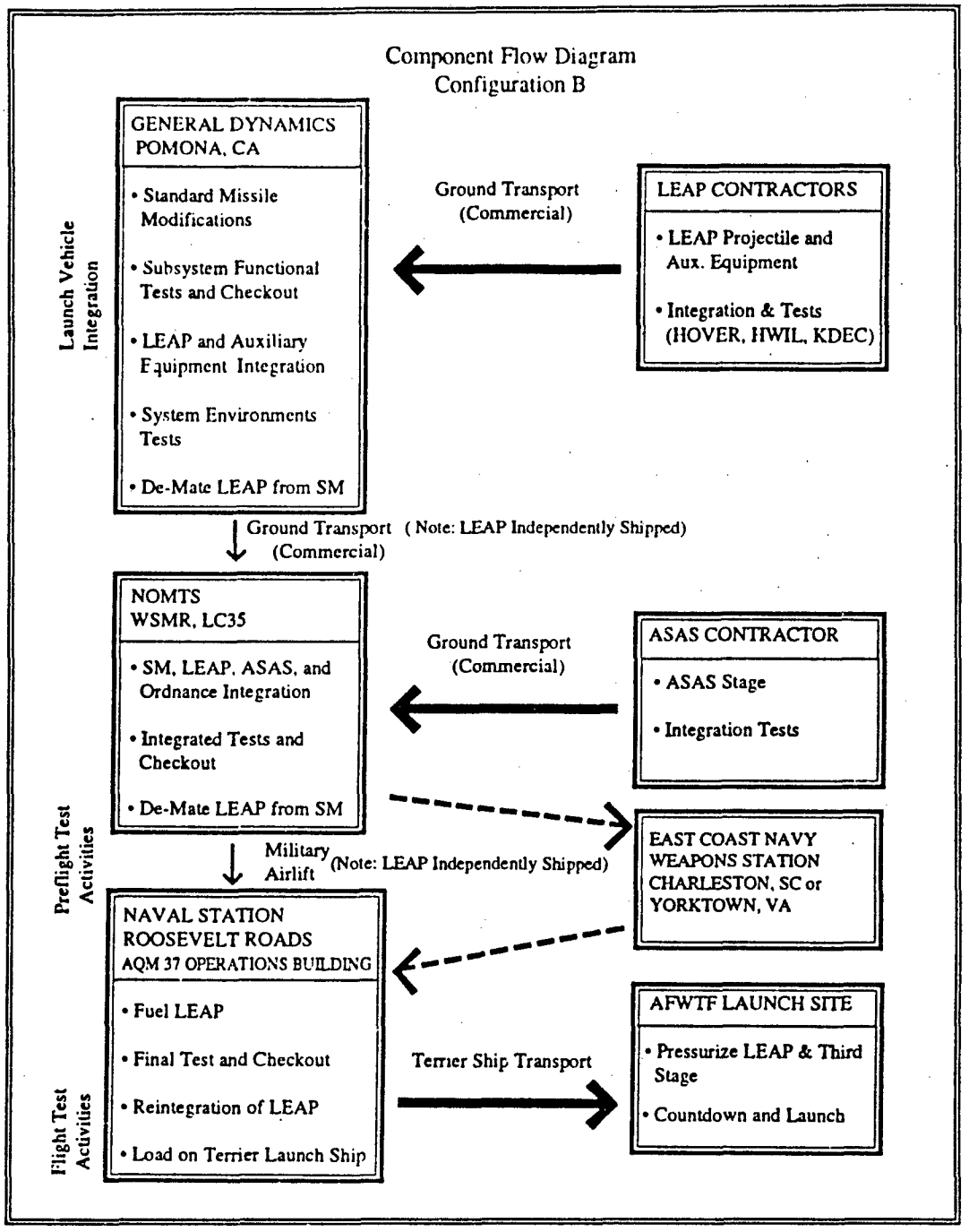

Exhibit 1.6: Configuration B Component Flow

Source: Louis Berger International, Inc., 1992.

C. Target Launch Vehicle

The M56A1 or M56A1 and M57A1 Rocket Motors will be transported by commercial truck from the Ballistic Missile Organization at Hill Air Force Base (AFB), Utah, to CCAFS, Florida. Orbital Sciences Corporation, Space Data Division will integrate the non-ordnance components of the launch vehicle in Chandler, Arizona. This will occur in the same facilities used to support other LEAP test program activities as discussed in the LEAP EA (Ref #1). Space Data Division personnel will integrate the launch vehicle at SLC-20 at CCAFS. These procedures will be in accordance with existing DOT and DoD regulations used for similar shipments of Aries Launch Vehicles to WSMR for LEAP test flights.

D. Hypergolics

The MMH or N_2H_4, and N_2O_4 oxidizer used for the LEAP projectile will be shipped from the NASA/White Sands Test Facility (WSTF) in WSMR, New Mexico or Kelly AFB in San Antonio, Texas to Port Canaveral, Florida. The oxidizer will be shipped separately from the fuel in a government truck appropriately labeled and equipped per DOT regulations, as identified in 49 CFR Part 178 and BOE Manual 6000. Return transportation of any residual fuel or residues will be the reverse of the delivery process. These processes have previously been addressed in the LEAP EA (Ref #1) and LEAP Supplemental EA (Ref #83).

If transported from Kelly AFB, the MMH or N_2H_4, and N_2O_4 oxidizer will be shipped in approved HOKE (trade name) stainless steel bottles procured by PL. Empty HOKE bottles will be shipped to Kelly AFB, filled with liquid bipropellants, and shipped by Kelly AFB to Port Canaveral in Florida under the DOT and BOE regulations previously identified. Transportation of any residual fuel will be the reverse of the delivery process.

PL will coordinate transportation of fuels from Port Canaveral at CCAFS, Florida to U.S. Naval Station Roosevelt Roads via commercial barge in accordance with BOE Manual 6000. Once liquid propellants reach Ops Pier at Naval Station Roosevelt Roads, PL and Weapons Department personnel will transport the propellants via existing explosives routes to the Weapons Department's Ready Service Lockers #1665, #1666, #1667, or #1668 (only two lockers are required) for storage prior to fueling the SM LEAP Launch Vehicle. The fuel and oxidizer will be stored in separate lockers and no modifications to the lockers are anticipated. The lockers were originally designed for chemical weapons; therefore, the lockers are suitable for the hypergolics (impermeable floors, explosion proof characteristics, etc.). Removal of the residual propellants or residues will be the reverse of the above-described operation.

1.2.4.2 Propellant Fueling Operations

All liquid fueling operations and procedures will be approved by the Navy WSESRB and will comply with Navy Regulation OP-199 Vol I, II (Handling and Storing of Liquid Propellants). All fueling operations of the integrated SM LEAP Launch Vehicle will occur at Naval Station Roosevelt Roads, Puerto Rico. The only component requiring liquid fueling operations will be

the LEAP projectile. PL standard operations (as described in the LEAP EA) will be followed for fuel handling, operation, and storage at Naval Station Roosevelt Roads. PL has developed Propellant Transfer Technical Operations Procedures (TOPs) for the handling of liquid bipropellants used for fueling the LEAP projectiles and has performed these procedures successfully on numerous occasions at the National Hover Test Facility and WSMR.

The PL specially trained workers will wear OSHA Level B personal protection suits at all times during the fueling operations. Fueling will occur in accordance with Occupational Safety and Health Administration (OSHA) guidelines for handling hazardous and toxic materials and with Standard Safety Operating Procedures (SSOPs) developed for the handling of the fuel and oxidizer at Naval Station Roosevelt Roads. Building 380 has previously been used to handle substances more hazardous than hydrazine. All appropriate safety equipment (e.g., showers and eyewash facilities) is present at the fueling facility. The total time between fueling and launch will be nominally less than eight days; however, projectile tanks have demonstrated 6 months of fueled storage capability with no leaks or anomalies noted (Ref #26).

Fuel Carts - A transportable fueling shelter, similar to the one referenced in the LEAP Supplemental EA, may be included with the LEAP support equipment at Building 380 for fueling operations. Propellant carts and test support equipment will be supplied by PL and the appropriate projectile contractors. Fuel carts will be used to transfer the fuels from the HOKE bottles to the LEAP projectiles at Building 380. The fuel carts contain all necessary storage, liquid transfer, and safety systems for transporting the liquid propellants, and consist of a pressurization system (helium or nitrogen), a propellant scale, manifolding and valves used to regulate flow, and a stainless steel propellant transfer bottle. The cart works in conjunction with a propellant decontamination and neutralization system (PDNS) cart that uses 40 gallons of water to dilute trace amounts of residual propellants.

Fueling Operation - The fueling operation will follow these general procedures:

- Move the fuel from Ready Service Lockers (storage facility) to Building 380
- Transfer fuel from the bulk container to the fuel cart
- Return bulk container to Ready Service Lockers
- Load LEAP projectile with fuel from fueling cart
- Move bulk container to Building 380
- Return excess/un-used fuel to bulk container
- Return bulk container to Ready Service Lockers
- De-contaminate fueling carts in Building 380
- Return cart to Ready Service Lockers
- Repeat above steps for the oxidizer with the HOKE bottles
- Retain fueled system in Building 380 for storage or transport to Terrier ship

Any spilled fuel will be captured in a drip trap that is an integral part of the fueling cart system. The fuel would then be vacuumed up by the cart and neutralized. Removal of this material from the installation for proper disposal would occur in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Resource Conservation and Recovery Act (RCRA). The fueled SM LEAP Launch Vehicle will be transported to the Ops Pier with fire truck escort via existing explosive routes and loaded onto the Terrier ship.

Pressurization - The following flights have propellant and pressurization requirements: flight test 3 has a third stage ACS; and flight tests 4-5 have 3rd stage ACS and 4th stage LEAP ACS, cooling, and pressurized fuel tanks. The LEAP tanks will be pressurized on-board the Terrier ship during the actual launch countdown. Pressurization for the AFWTF Terrier ship flights will be approved by SDIO/PL and WSESRB. The high pressure helium/nitrogen cart will be operated only on the Terrier ship, during the actual countdown, by procedures approved and certified by the WSESRB. Operations will comply with Navy Regulations OP-3199 Vol I, II (Handling and Storing of Liquid Propellants) and OP-4 Vol I (Explosives Afloat). The LEAP projectile will use pressurized cold gaseous nitrogen (GN_2) or gaseous helium (GHe) for pressurizing the fuel tanks, ACS, and cooling bottle. The 3rd stage will use pressurized GN_2 for attitude control.

1.2.4.3 Ground Test Activities

A. General Dynamics

SM LEAP Launch Vehicle system integration, test and checkout, and system environment tests of all non-ordnance subsystems (including the unfueled, unpressurized projectile) will occur at General Dynamics. The tests will be performed using existing facilities and equipment.

B. WSMR

The WSMR tests will utilize existing SM facilities and equipment (Building N300) (Exhibits 1.7 and 1.8). The SM is routinely integrated and tested at WSMR (the referenced facilities and launch site are maintained for this purpose). Integration of the ordnance components to the SM LEAP Launch Vehicle and test and checkout will occur here (i.e., ASAS, sustainer, warhead, etc.). No construction or modification of existing facilities is required to perform these tests.

C. Terrier Ship

Test activities on-board the Terrier ship will include adjustments to the ship system fire control software to allow ship tracking and control of the SM at high altitudes. A minimum set of projectile support equipment (e.g. test and checkout and pressurization "carts") may be located in the ship "Ready Room". This equipment will be self-contained to eliminate risk to ship

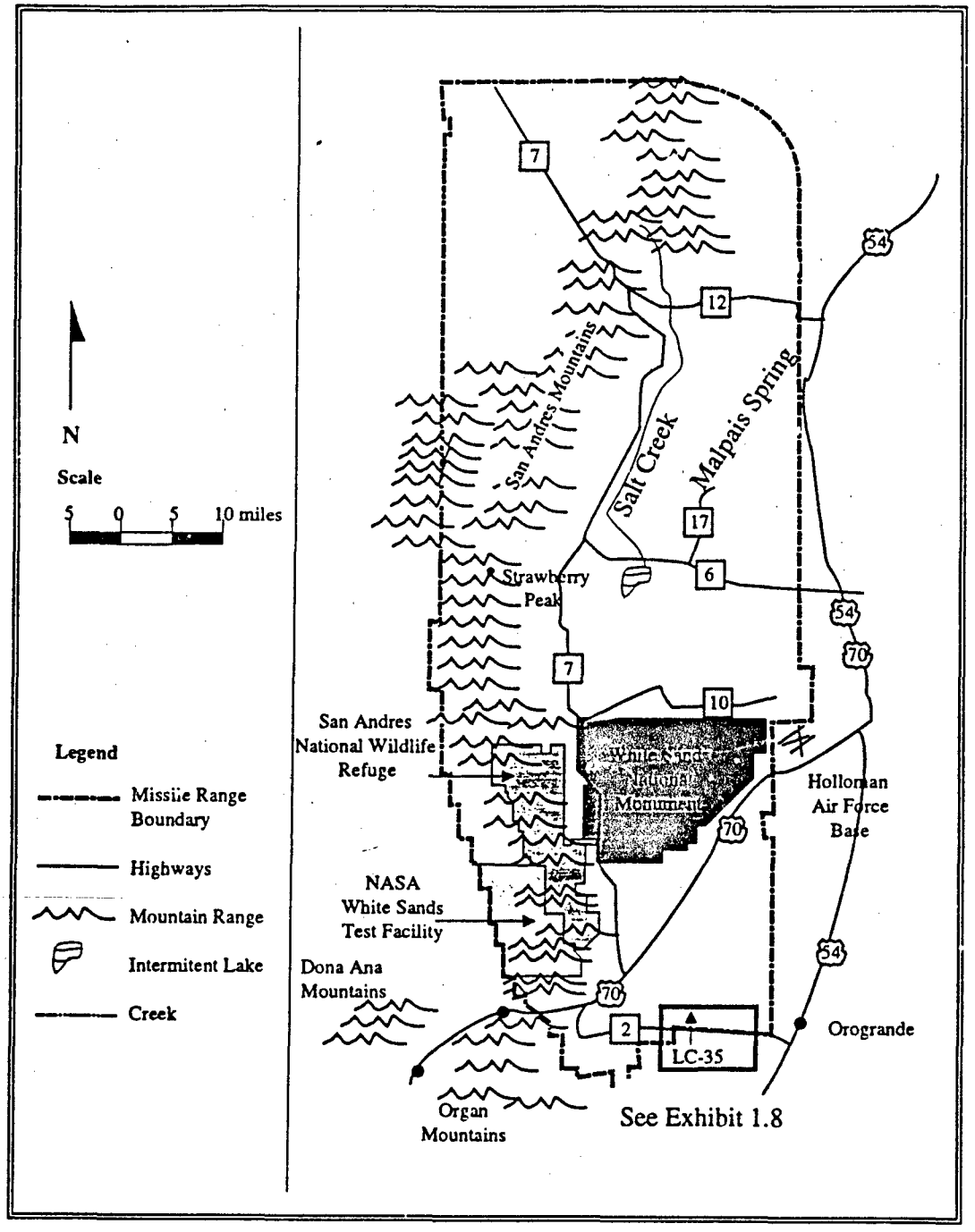

Exhibit 1.7: White Sands Missile Range (WSMR)
Source: Louis Berger International, Inc., 1992.

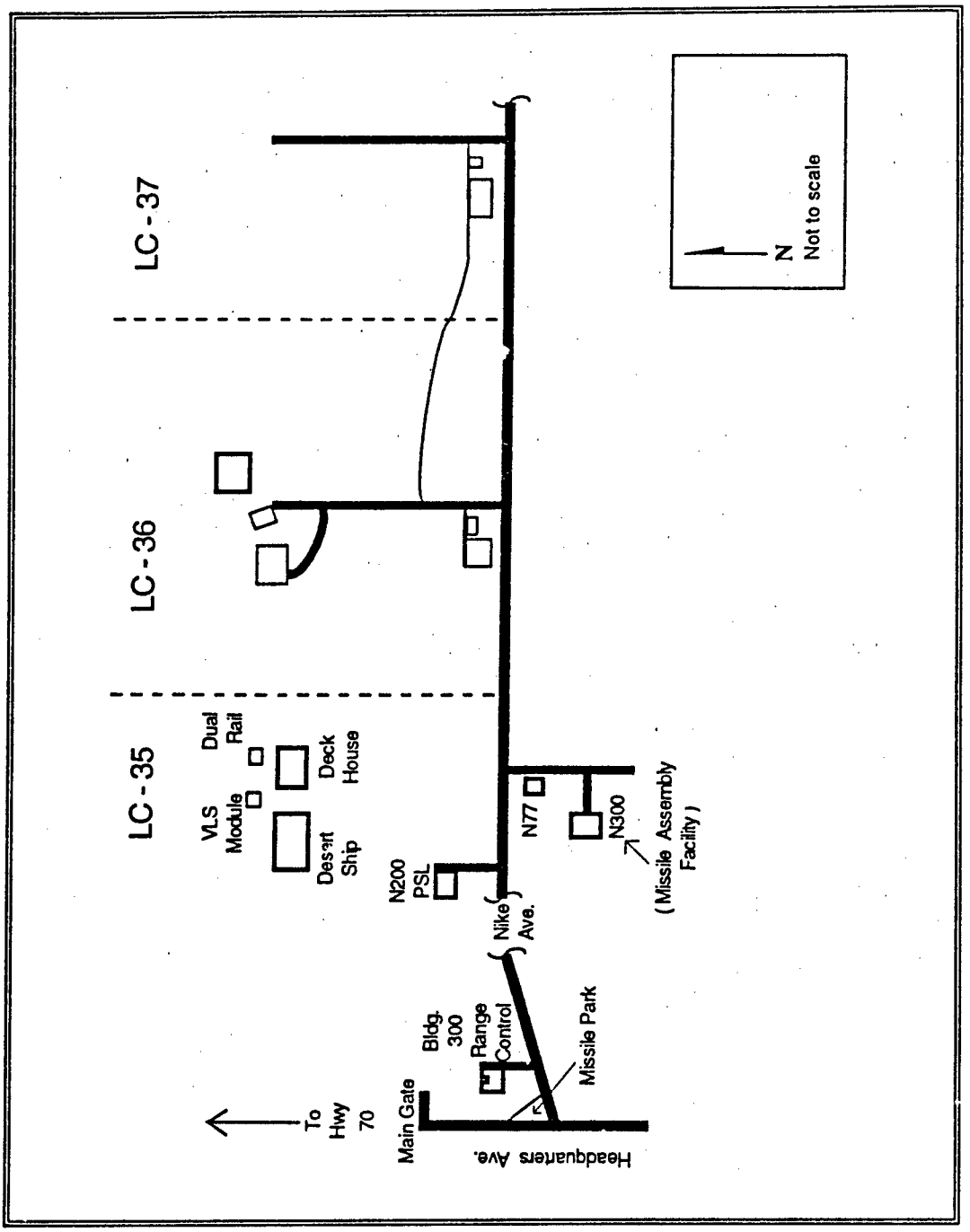

Exhibit 1.8: WSMR Launch Complex 35
Source: Louis Berger International, Inc., 1992.

operations and safety. No construction or modifications of the Terrier ship are required to perform these preflight tests. The specific Terrier ships for the LEAP demonstration flights have not yet been selected. Appropriate Navy certifications and approvals will be obtained from the WSESRB and involved agencies.

D. U.S. Naval Station Roosevelt Roads

The Terrier ship will stage at Naval Station Roosevelt Roads (Exhibit 1.9) prior to deploying to the specific launch location. The unfueled SM LEAP Launch Vehicle will be unloaded from aircraft with handling equipment at Building 380 for fueling activities (Building 380 is explosive rated for 1,000 pounds of equivalent Hazard Class/Division 1.3 propellants, and can support the SM/ASAS/LEAP components). A minimum of 9 days will be required for operations at Naval Station Roosevelt Roads. A nominal 20 days are planned for first receipt of hypergolics to final departure of residuals and equipment.

Navy approval and certification for the integrated SM, LEAP projectile, and ASAS handling and storage will be obtained through the Navy Weapons Station. AFWTF tracking, telemetry, and control facilities will be utilized in their current configuration. Only minor modification of existing facilities are required for fueling activities. These modifications include minor electrical and air conditioning upgrades to the interior of Building 380.

E. CCAFS

The preflight activities at CCAFS (Exhibit 1.10), Florida include transporting the Aries Target Launch Vehicle components, fuels, and testing equipment to the launch site. Preflight tests involve missile integration and checkout. The facilities constructed, modified, and utilized by the Starbird and Red Tigress programs at CCAFS adequately provide for Aries Launch Vehicle launches. The facilities to be used for the Target Launch Vehicle include the Missile Assembly Building (MAB#3), Space Launch Complex (SLC)-20, Payload Assembly Building (PAB), and SLC-20 pad and blockhouse (Exhibit 1.11). No construction or modification of existing facilities is required to perform these preflight tests.

1.2.5 Flight Test Activities

Flight test activities are planned in the ALFA Range at AFWTF, Puerto Rico (Exhibit 1.12) and CCAFS, Florida. Flight test activities include rocket launch, monitoring and control of the rocket during flight, and data retrieval. All flight tests will use existing facilities and ranges at AFWTF and CCAFS. The demonstration will consist of five flight tests from a Terrier ship operating within AFWTF and CCAFS, using a modified SM and integrated LEAP technologies (Exhibit 1.13). LEAP technologies include infrared (IR) seekers, axial and divert propulsion systems, avionics, and electrical and mechanical interfaces. Two versions of the SM will be used: a modified SM vehicle that accommodates a mock LEAP projectile to test high altitude flight of the SM; and a modified SM vehicle with an actual LEAP projectile and ASAS. Flight tests 1-4 are single-rocket launches from AFWTF to demonstrate SM and LEAP integration and

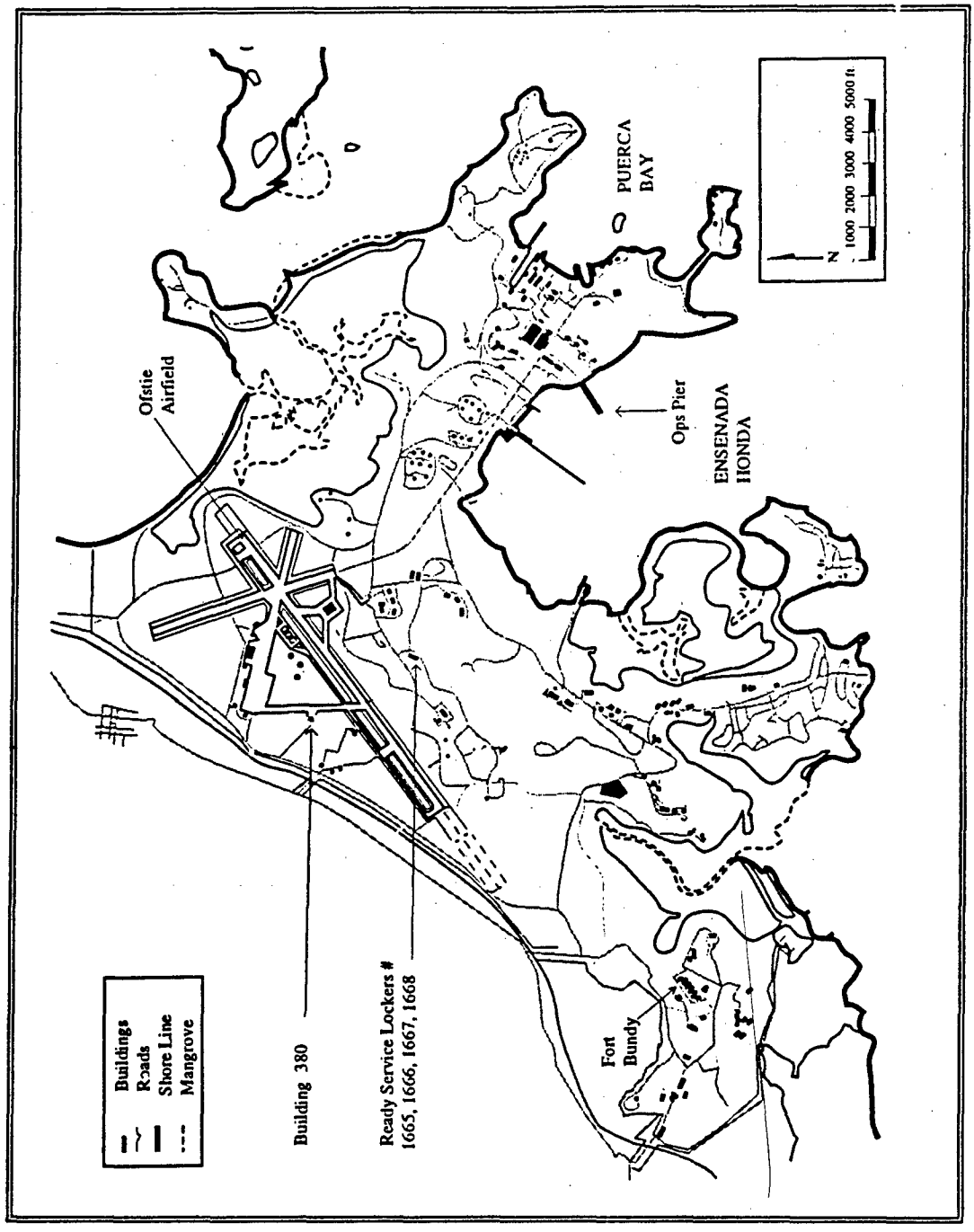

Exhibit 1.9: U.S. Naval Station Roosevelt Roads, Puerto Rico
Source: Louis Berger International, Inc., 1992.

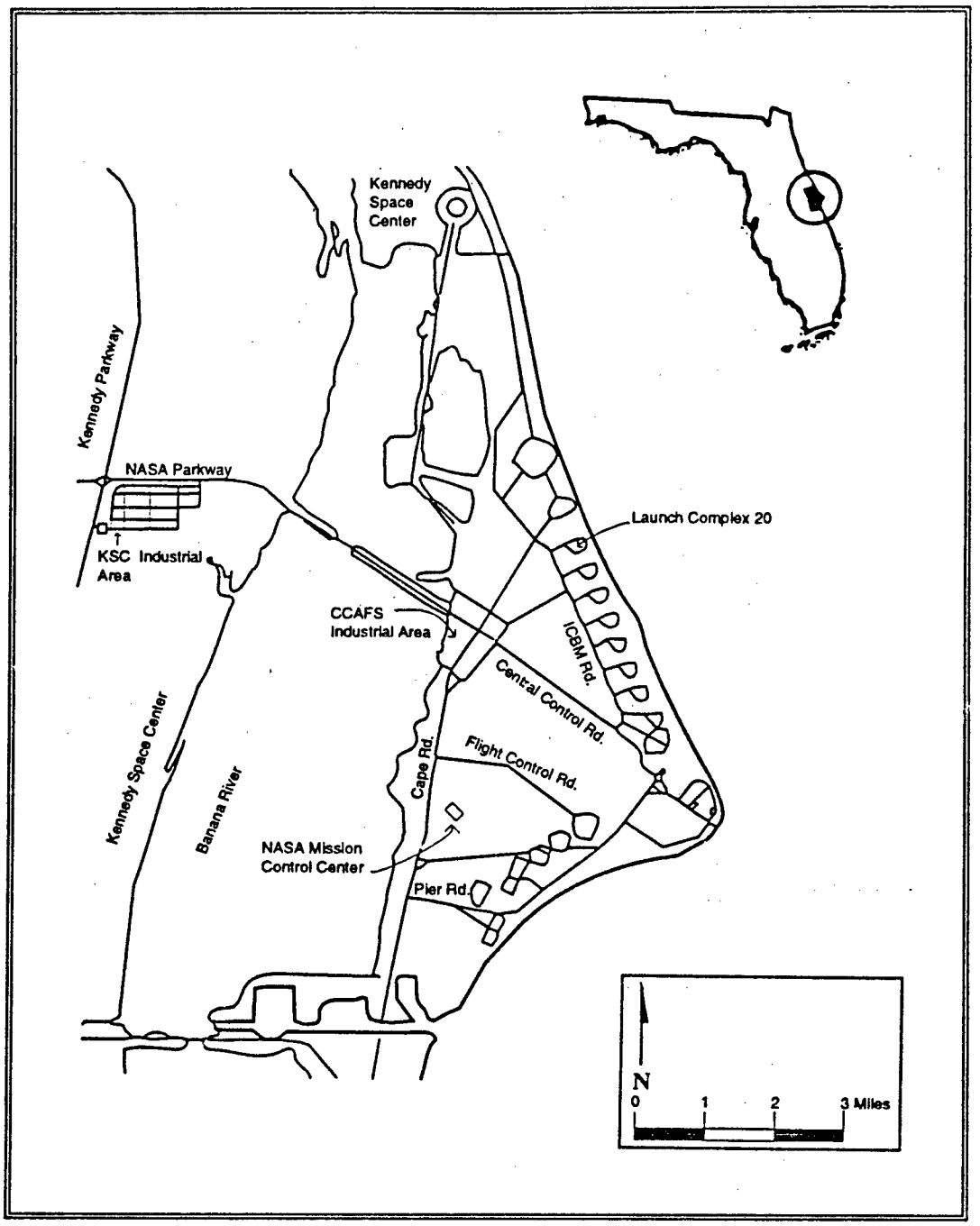

Exhibit 1.10 Cape Canaveral Air Force Station

Source: Project Starbird EA.

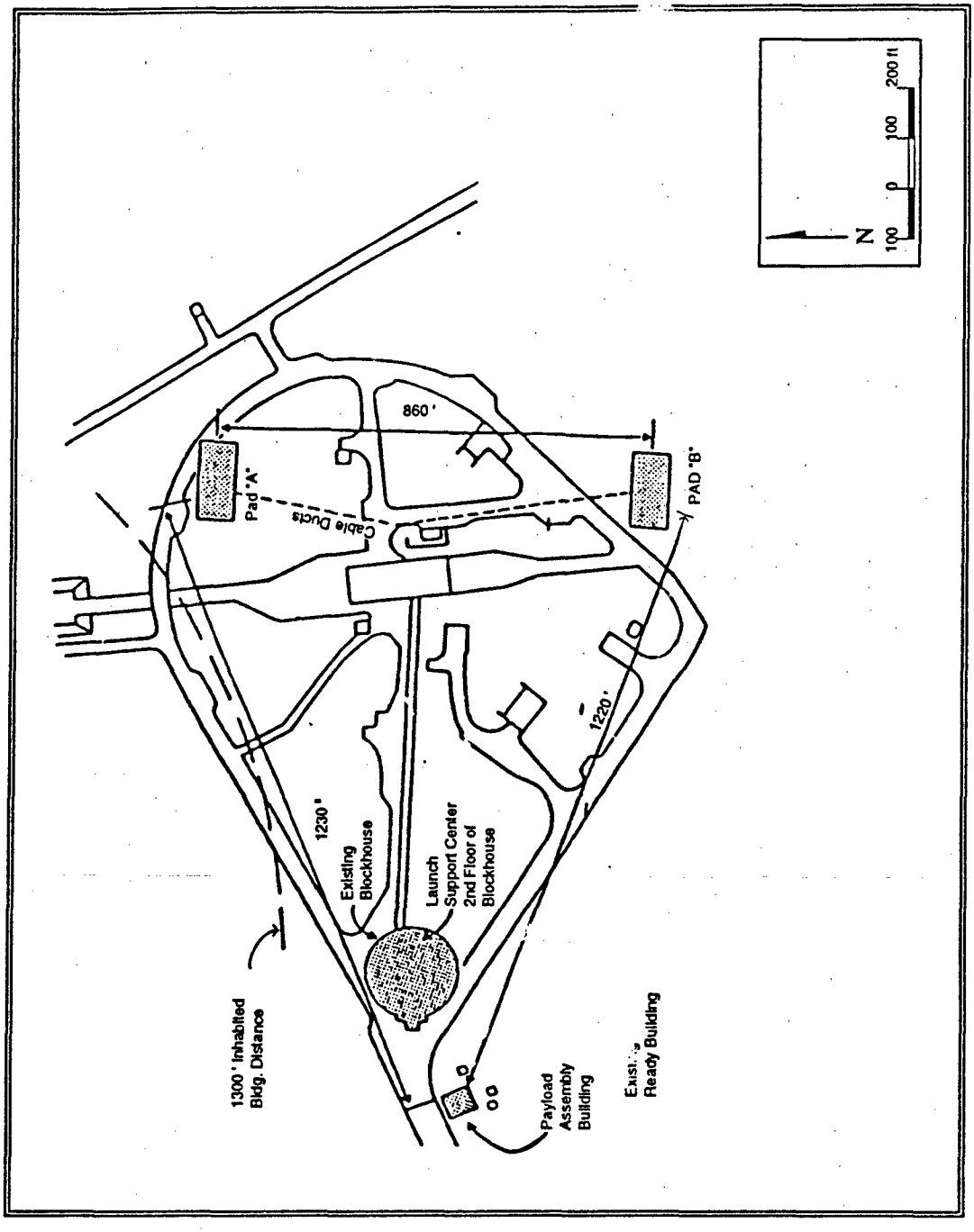

Exhibit 1.11 Space Launch Complex 20

Source: Project Starbird EA.

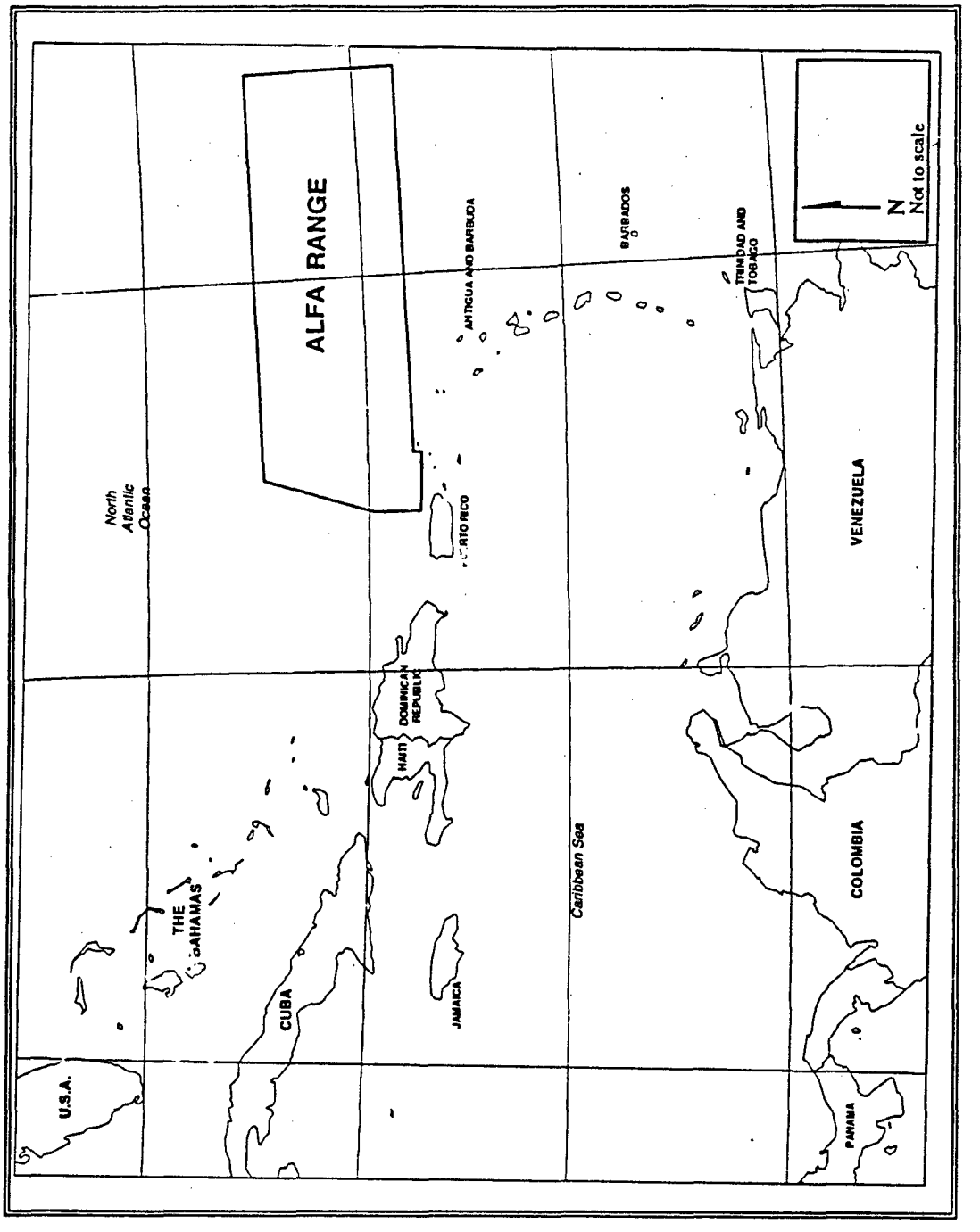

Exhibit 1.12: AFWTF / ALFA Range
Source: SDIO, 1992.

Flight Test	Anticipated Schedule	Location	Payload
1	4th Quarter FY 92	AFWTF	Ballast to simulate LEAP Projectile
2	4th Quarter FY 93	AFWTF	LEAP Mockup
3	2nd Quarter FY 94	AFWTF	Unfueled LEAP/ASAS motor
4	3rd Quarter FY 94	AFWTF	Fueled LEAP/ASAS motor
5	4th Quarter FY 94	CCAFS	Fueled LEAP/ASAS motor — ARIES Target

Exhibit 1.13: Launch Locations and Schedule

operations. Flight test 5 is a two-rocket launch over open ocean within the jurisdiction of CCAFS with a SM LEAP Launch Vehicle launched from the Terrier ship and a Target Launch Vehicle launched from CCAFS. Flight test 5 will demonstrate the actual interception of a target by the LEAP projectile.

The Navy and General Dynamics will be responsible for flight test services for the Navy LEAP Technology Demonstration, and will provide mission planning, analysis, certification, and range operations at AFWTF/U.S. Naval Station Roosevelt Roads and on-board the Terrier ship. PL will be responsible for coordinating payload ground operations, which include fueling the projectiles at Naval Station Roosevelt Roads. SDIO will provide target Launch Vehicles at CCAFS.

Existing Navy facilities, tracking and telemetry equipment, and ranges at AFWTF/U.S. Naval Station Roosevelt Roads, Puerto Rico will be used for flight tests 1-4. A Terrier ship will launch the SM LEAP Launch Vehicle from a point within the North (ALFA) Weapons Range of AFWTF, approximately 30 miles northeast of Puerto Rico in the Atlantic Ocean. The launch locations, trajectories, and dispersions will be contained within the ALFA range to ensure downrange safety and maximize data collection opportunities.

1.2.5.1 Flight Test 1

The objectives of flight test 1 will be to demonstrate exoatmospheric flight of the SM (Configuration A), validate high altitude simulations, and demonstrate telemetry, tracking, and control of a high altitude SM. The launch point will be approximately 30 miles northeast of Puerto Rico within the ALFA range of AFWTF. The launch azimuth will be approximately 60 degrees (with a launch elevation of 65 degrees) to contain the launch within the ALFA range, ensure downrange safety, and maximize data collection opportunities.

Upon launch, the 1st and 2nd stage will ignite and burn to completion After 2nd stage burnout, the missile will continue to an apogee of approximately 110 kilometers (68.3 miles) approximately 133 seconds after launch at a downrange distance of 130 kilometers (86.9 miles). Nominal splashdown of the SM is calculated at 320 seconds after launch, downrange 300 kilometers (187.5 miles)(Exhibit 1.14).

In addition to shipboard radars and telemetry receivers, data collection equipment will include 10 foot telemetry dishes located at Pico Del Este, Puerto Rico, radars at St. Thomas and St. Croix, U.S. Virgin Islands, and telemetry at Antigua. No mobile data collection equipment is planned for this mission.

1.2.5.2 Flight Test 2

The primary objective of flight test 2 is to demonstrate integration and operation of the mock LEAP, clam shell nose, LEAP ejection mechanism, and flight sequencer with the SM (Configuration A). Additional objectives include measurement of shock, vibration and thermal environments for the LEAP projectile and demonstration of refined autopilot modifications (based on flight test 1 data). After launch, all sequences will be the same as flight test 1; however, at approximately 80 kilometers (49.7 miles) altitude the clamshell nose will open and the mock LEAP will be ejected. For nominal trajectories, the LEAP projectile and SM will reach an apogee of approximately 110 kilometers (68.3 miles) with splashdown 300 kilometers (187.5 miles) downrange. Total flight time is estimated at approximately 320 seconds (Exhibit 1.15). The equipment supporting this flight test will be identical to flight test 1, with the addition of High Altitude Learjet Observatory (HALO) or Argus observation aircraft staged out of CCAFS or Puerto Rico.

1.2.5.3 Flight Test 3

The primary objectives of flight test 3 are to demonstrate third stage separation and attitude control of the SM LEAP Launch Vehicle (Configuration B), and to test operation and integration of the ASAS. Additional objectives are to demonstrate LEAP Inertial Measuring Unit (IMU) alignment and third stage telemetry. The launch point and flight azimuth are identical to flight tests 1-2. After launch, the 1st and 2nd stage burns will occur as per flight tests 1-2. The missile will then begin a 30 second coast period prior to ASAS ignition. After ASAS burnout and prior to apogee at approximately 150 km (93.2 miles) 145 seconds after launch, the modified LEAP projectile will be ejected. Splashdown will occur approximately 475 kilometers (295.1 miles) downrange (Exhibit 1.16).

Use of the USNS Redstone and/or Advanced Range Instrumentation Aircraft (ARIA) is planned for flight tests 3-5 for downrange support (passive data acquisition only). The USNS Redstone, an instrumentation ship used to supplement and obtain data in areas outside the limits of land

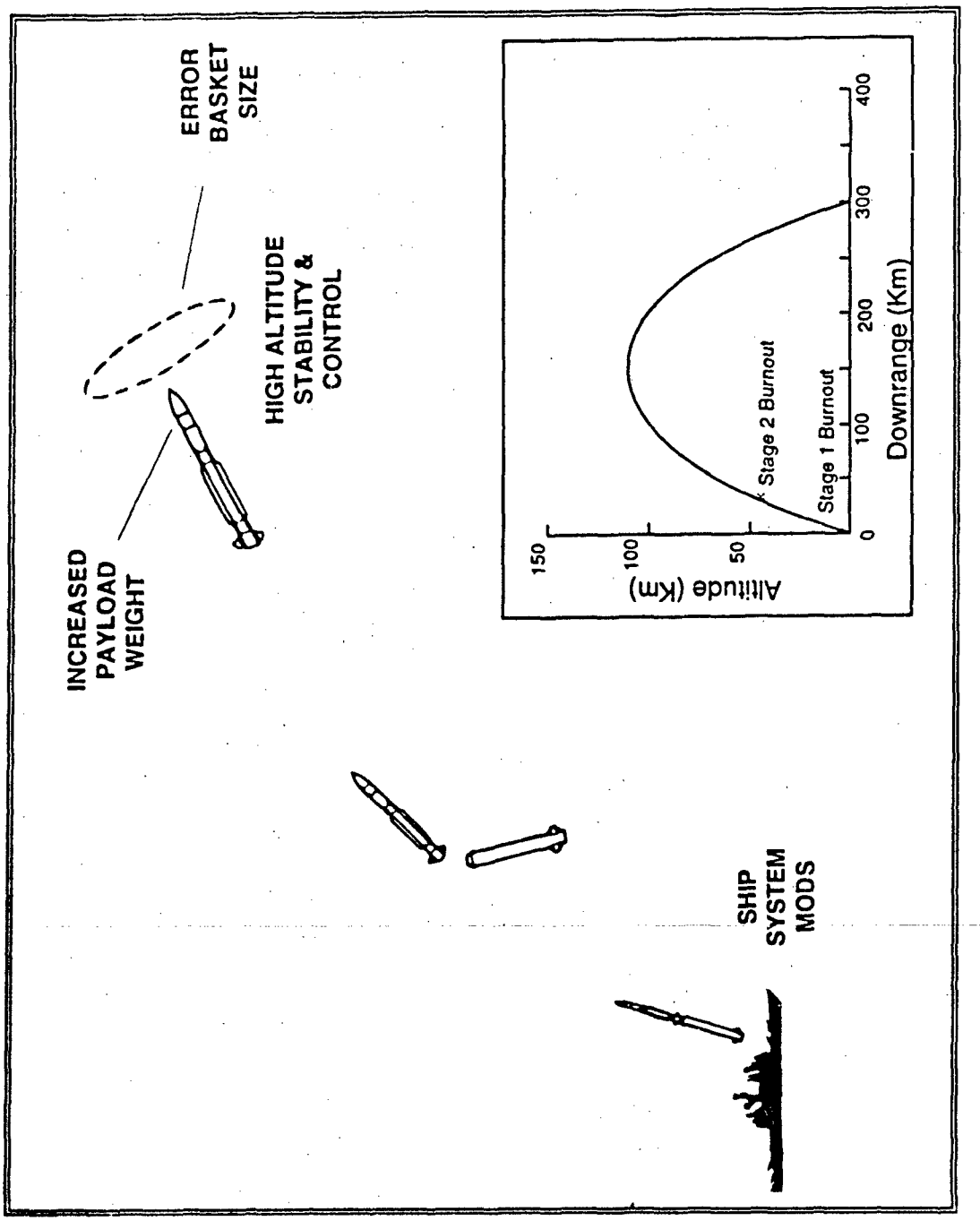

Exhibit 1.14: Flight Test 1

Source: SDIO, 1992.

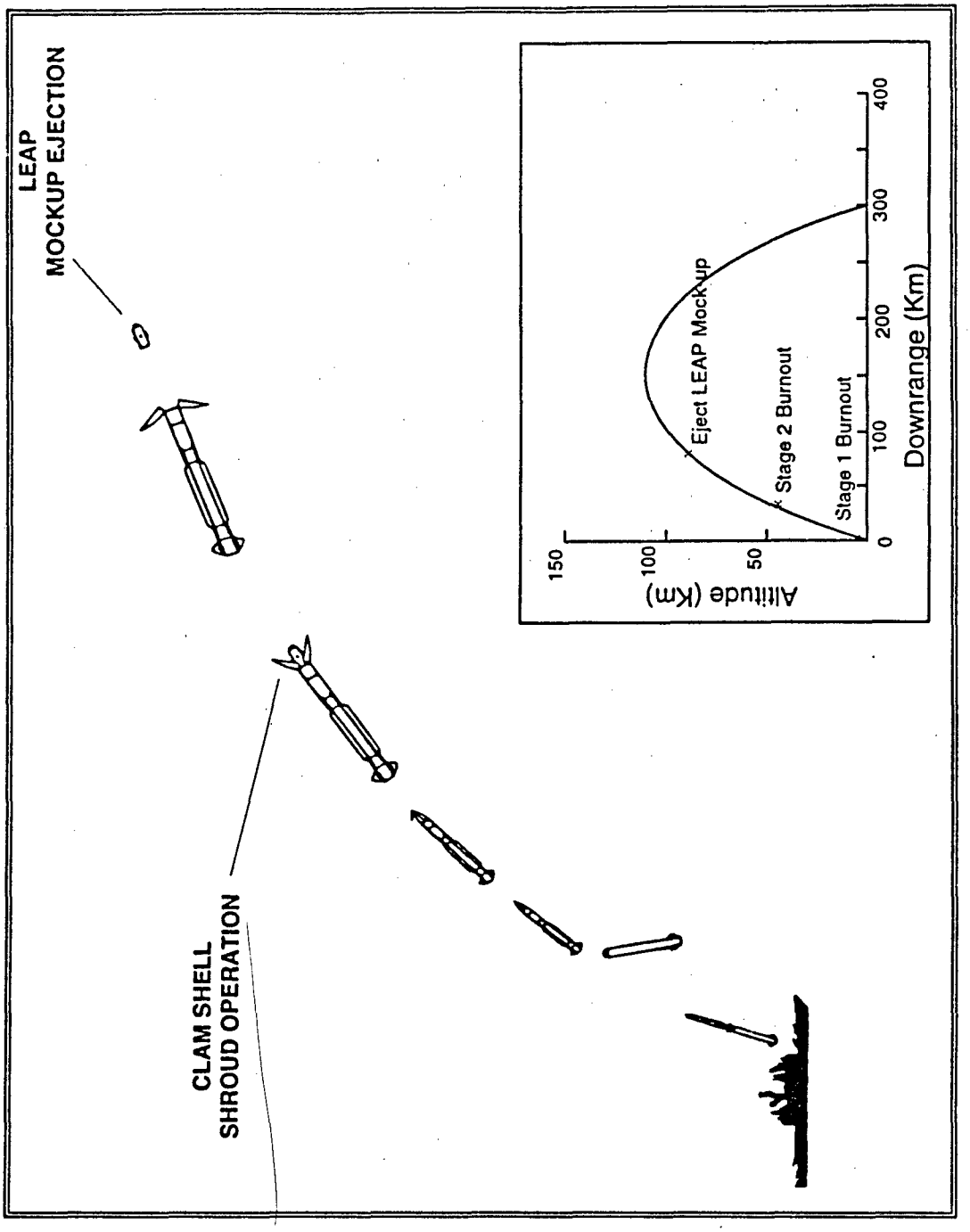

Exhibit 1.15: Flight Test 2
Source: SDIO, 1992.

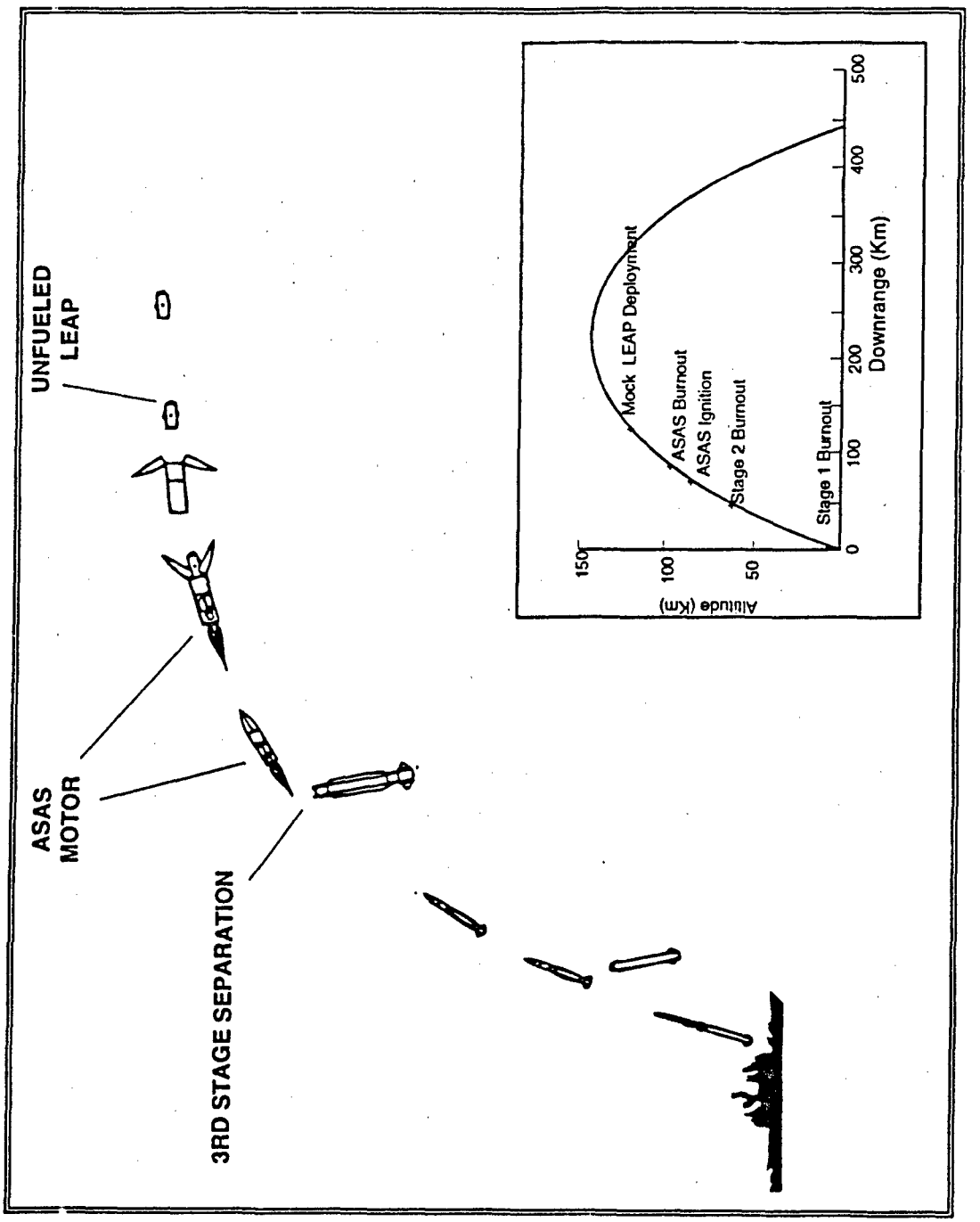

Exhibit 1.16: Flight Test 3
Source: SDIO, 1992.

stations, will employ C-band radar, telemetry antennas, and optical tracking and recording equipment. The USNS Redstone will support the fire control system in controlling launches, if necessary. The ARIA would employ its telemetry equipment for monitoring launches or relaying telemetry. The telemetry dishes at Antigua may also be utilized for additional data collection during this flight.

1.2.5.4 Flight Test 4

Flight test 4 will involve the first fueled LEAP projectile. Test objectives include flight test 3 objectives, plus demonstration of LEAP search, acquisition, maneuverability, and handover accuracy. The flight profile for flight test 4 will be identical to flight test 3; however, following ASAS burnout the projectile will be ejected and will begin acquisition and tracking of a stationary target (i.e., a star or celestial object). At this point the projectile will orient and divert for a simulated interception. During the divert, the trajectory will change, but will remain within the ALFA range. From a nominal impact point, the worst case divert is within a 75 kilometer (46.6 mile) radius. Time of splashdown will be approximately 408 seconds after launch, with a downrange distance of approximately 460 km (295.1 miles) (Exhibit 1.17). The USNS Redstone and/or ARIA will be utilized for flight test 4.

1.2.5.5 Flight Test 5

Flight test 5 is a two-rocket launch designed to demonstrate the ability of the SM LEAP interceptor in acquisition, tracking, and intercept of a high speed ballistic missile target. The SM LEAP Launch Vehicle will be launched from a Terrier ship approximately 1,000 kilometers (621.2 miles) east of SLC-20 in the Atlantic Ocean. The Aries Target Launch Vehicle will be launched from SLC-20 CCAFS. The SM launch, trajectories, dispersions, and intercept debris will be contained over open ocean within the jurisdiction of CCAFS.

The launch azimuth of the Target Launch Vehicle will be approximately 90 degrees. Apogee will occur 337 seconds after launch with an altitude of 390 kilometers (242.3 miles) on a 90 degree azimuth. The SM LEAP vehicle's azimuth will be between 190 and 340 degrees, depending on specific ship location. The trajectories and 3-sigma dispersion area will be contained within the approved CCAFS range (open ocean). The LEAP projectile will be launched approximately 272 seconds after launch of the Target Launch Vehicle and will continue with a similar sequence as described in flight test 4. The launch elevation for the LEAP vehicle will be adjusted to allow the projectile to intercept while ascending, approximately 100 kilometers (62.1 miles) altitude and 800 kilometers (500 miles) east of SLC-20. Intercept will occur by impact approximately 10 minutes after target launch. Flight test 5 launch characteristics are illustrated in Exhibits 1.18 and 1.19.

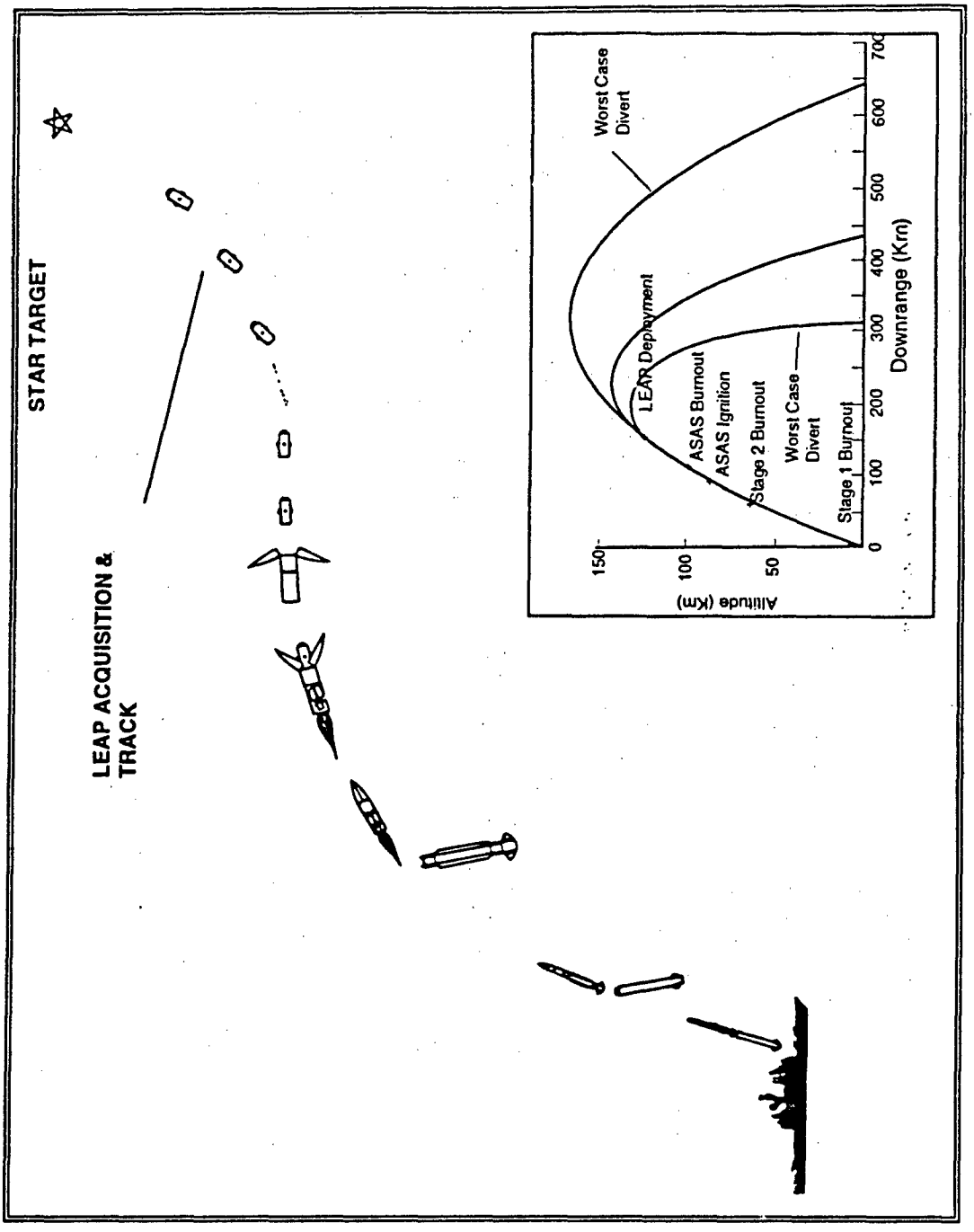

Exhibit 1.17: Flight Test 4
Source: SDIO, 1992.

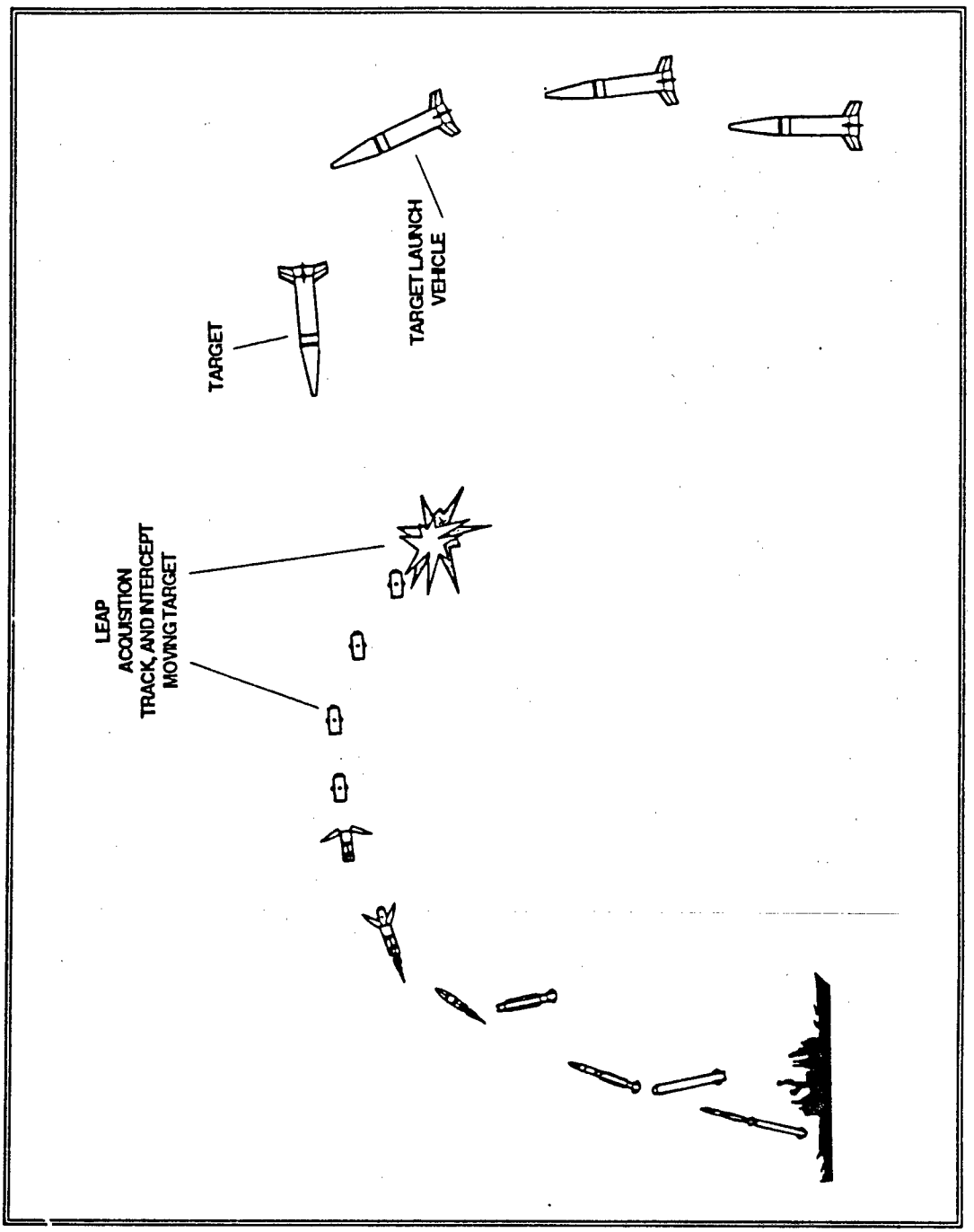

Exhibit 1.18: Flight Test 5
Source: SDIO, 1992.

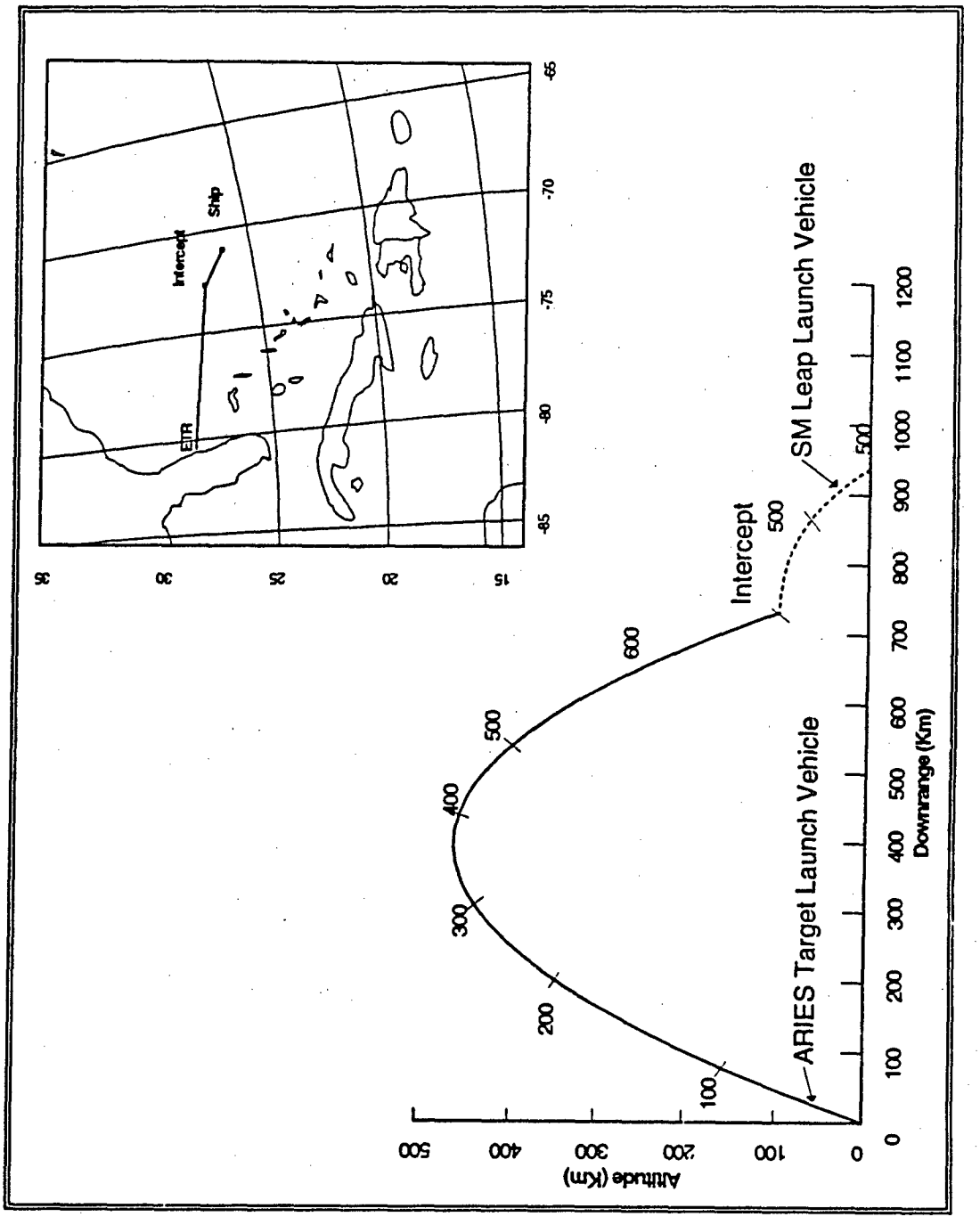

Exhibit 1.19: Flight Test 5
Source: SDIO, 1992.

Overall mission integration and control of the CCAFS open ocean launches will be performed by the 45th Space Wing, U.S. Air Force. Existing CCAFS tracking and telemetry equipment will be utilized to support the safety and mission requirements. The HALO and/or Argus observation aircraft may be used to monitor the flight test. The CCAFS Multi-Object Tracking Radar (MOTR) will also be utilized for data acquisition and possible fire-control support. CCAFS equipment (GPS Translating Processing System (TPS)) and an Aegis ship (data acquisition) are planned to support the fire-control for this mission. The Aegis ship will likely operate in the area between CCAFS and the Terrier ship. The USNS Redstone and/or ARIA will support the mission (passive data collection role). Flight safety responsibility for the SM LEAP Launch Vehicle will reside with the test conductor on-board the Terrier ship and the ship's Captain.

1.2.6 Postflight Activities

Postflight activities are planned to occur at AFWTF, Puerto Rico; and CCAFS, Florida.

1.2.6.1 Recovery

Debris from the AFWTF and CCAFS launches will be dispersed over open ocean and will not be recovered.

1.2.6.2 Facility De-Mobilization/Decommissioning

The only equipment that will be de-mobilized is the specific LEAP support equipment (i.e., fuel handling carts from Naval Station Roosevelt Roads and test equipment from on-board the Terrier ship). Removal of fuel handling carts will be the responsibility of PL. If a temporary enclosure is used at Building 380, it will be removed. The Terrier ships used for the tests off AFWTF and CCAFS will continue operational duties.

1.2.6.3 Decontamination

Decontamination of fueling carts will be performed in accordance with the plans described in the LEAP EA. Decontamination of the propellant carts occurs in a closed system, preventing propellant release to the atmosphere. All gases or liquids are removed by vacuuming. Trace amounts of the propellants, after being purged through the system, are diluted in 40 gallons of water in a 55 gallon tank.

1.2.6.4 Hazardous Waste Disposal

Hazardous waste disposal will be in accordance with the procedures established in the LEAP EA, the SM EA, the practices and procedures at CCAFS SLC-20 (Starbird EA), Naval Station Roosevelt Roads standard safety practices, and standard Navy ship-board operating procedures. Proper disposal of any fuels or residuals will be the responsibility of PL in cooperation with NASA or Kelly AFB.

Decontamination of the hydrazine and nitrogen tetroxide loading carts culminates in trace amounts of the propellants being diluted with approximately 40 gallons of water in a 55 gallon closed tank. This propellant/water mixture will be returned to PL at Edwards AFB and turned over to contractors for proper treatment and disposal in accordance with RCRA regulations. As previously stated, this process has been analyzed in the LEAP EA (Ref #1) and LEAP Supplemental EA (Ref #83). All procedures for the Navy LEAP demonstration will occur in accordance with the practices set forth in those document.

1.2.7 Ground and Flight Safety

Regardless of launch location, LEAP procedures will follow the same SSOPs for fueling and transportation developed by PL and used successfully at WSMR under the LEAP Test Program. Flight safety will be ensured by proper selection of launch azimuth and use of a range-approved flight termination system. All operating procedures and hardware configurations will be approved by the WSESRB. Navy LEAP activities will be conducted in accordance with Navy safety program procedures which will likely include the following:

• OPNAVINST	5100.8G	Department of the Navy Safety Program
• OPNAVINST	5100.24A	Navy System Safety Program
• OPNAVINST	8023.2C	Navy Explosives Safety Program
• OPNAVINST	8010.13A	UNS Policy on Intensive Munitions
• NAVSEAINST	8010.5A	Tech. Req. - Intensive Munitions
• NAVSEAINST	8020.6C	Navy Weapons System Safety Program
• SEA-06 G&PP	89-06	Approval of Weapon System T&E
• MILSTD	2015A	Hazard Tests for Non-nuclear Munitions

In addition, the following safety analyses will be conducted prior to program testing:

- System Safety Program Plan
- Preliminary Hazard Analysis
- Subsystem Hazard Analysis
- Operating and Support Hazard Analysis
- System Hazard Analysis

1.2.7.1 Explosives Ordnance

The SM and ASAS will be fueled by Al and oxidized by AP, which is a Hazard Class/Division 1.3, Storage Compatibility Group B explosive. The SM contains 1,202 pounds of these propellants. The liquid bipropellants for LEAP include a maximum of 504 grams of N_2H_4 or MMH as the fuel and a maximum of 833 grams of N_2O_4 as the oxidizer. The SM warhead contains Plastics Bonded Explosive (PBX) rated Hazard Class/Division 1.1. Hazard zones will be established in accordance with DoD Standard 6055.9 (DoD Ammunition and Explosive Safety Standards).

The Aries Launch Vehicles solid propellant rocket motors contain chemicals that are categorized as explosive ordnance. The M56A1 Rocket Motor (Aries I) contains 10,370 pounds of Hazard Class/Division 1.3 solid propellant. The M57A1 Rocket Motor (second stage Aries II) contains 3,657 pounds of Hazard Class/Division 1.1 solid propellant (Ref #1). The Aries II Launch Vehicle includes both the M56A1 and M57A1 for a total propellant weight of 14,027 pounds.

1.2.7.2 Fuel Handling

The PL standard operations and equipment (as per the LEAP EA) will be followed for fueling, fuel handling, operation, and storage at Naval Station Roosevelt Roads. PL has developed Propellant Transfer Operations Procedures currently in use for the handling of liquid bipropellants (Procedure Nos: 14697-TOP-460 and 14697-TOP-360) that will be used for the propellant fueling of the LEAP projectile. Procedures for pressurizing the 3rd stage will follow the same procedure for the LEAP projectiles. The high pressure helium/nitrogen cart used in pressurizing the fuels will be operated only on the Terrier ship, during the actual countdown, under procedures approved and certified by WSESRB and PL. Operations will comply with Navy Regulations: OP-3199 Vol I, II and OP-4 Vol I.

Per the LEAP EA, liquid fuel and oxidizer handling requires special safety precautions to ensure that the liquid fuels and oxidizer are separated until LEAP vehicle ignition. If mixed, the resultant hypergolic mixture would result in a fire. Closed systems are used to prevent releases into the environment. Containment facilities will be in place to collect any fuels or oxidizer that might spill during fueling. Liquid fueling will be performed in accordance with the SSOP that must be approved by the ground safety officer prior to commencement of activities. Building 380 is equipped with a shower, eyewash facility, and necessary safety equipment. For worker safety, OSHA Level B protection will be worn by operations personnel (Ref #1). The Weapons Department and Fire Department will support these operations. Unused fuel will be returned to NASA/WSTF or Kelly AFB for storage. The oxidizer transfer tank will be purged using the aspirator system, and the oxidizer will be diluted using water.

1.2.7.3 Noise Protection

Per the LEAP EA, personnel will be inside noise-insulated areas on the Terrier ship or buildings at CCAFS (outside the flight hazard areas). Hearing protection during launches ensures that short-term noise exposure does not exceed the OSHA criterion of 115 dBA for 15 minutes (Ref #1).

1.2.7.4 Launch and Range Control

AFWTF/U.S. Naval Station Roosevelt Roads - Launch control of the SM will be performed by the Terrier ship conducting the launch for the SM LEAP Launch Vehicle. The Terrier ship also will provide test execution and control, instrumentation, and flight termination, if necessary, for all SM flight tests.

For flight tests 1-4, range control will be provided by the AFWTF Commander for ground safety, flight safety, facilities, instrumentation, and launch approval to the test conductor (located on the ship). Control and coordination of the USNS Redstone and/or ARIA aircraft also will be the responsibility of AFWTF for these flight tests. The Range Operations and Control Center (ROCC) located at AFWTF headquarters is the control center for all ALFA range activities (Ref #28). The AFWTF Range Safety Officer (RSO) is responsible for controlling and coordinating range activities and equipment, and ensures safe conduct of the exercise in accordance with established range procedures; orders "hold fire" or missile destruction; and provides a clearance to fire when the hazard space is clear of non-participating units, and participating units are within safe boundaries. The firing unit (i.e., Terrier ship) is responsible for compliance with range firing procedures; firing only upon receipt of proper clearance; verification that hazard space is clear; and ordering "hold fire" or missile destruction if necessary (Ref #28).

The Federal Aviation Administration (FAA) Naval Liaison Officer Caribbean (NAVLO CARIB) will provide coordination with various FAA activities concerning Navy LEAP Technology Demonstration activities within the ALFA range (Ref #28).

For flight test 5, CCAFS/45th Space Wing will perform launch control of the Target Launch Vehicle and range control for both the Target Launch Vehicle and SM LEAP Launch Vehicle. The 45th Space Wing will provide Target Launch Vehicle ground and flight safety (and flight termination, if necessary), target facilities, instrumentation for both vehicles, coordination of AFWTF instrumentation, coordination of the USNS Redstone and/or support aircraft, and coordination with the Terrier ship.

White Sands Missile Range - Safety programs at WSMR are regulated by Army and OSHA regulations and are under the authority of the Commanding General. The Operations Control Division within the National Range Operations Directorate administers all other safety programs at WSMR. These programs are separated into two functions: 1) the Flight Safety Branch which provides safety planning and documentation support; and 2) the Safety Engineering Branch which provides flight termination research and development. Safety documentation is governed by the WSMR Range Users Handbook and WSMR 385-15 which prescribes policy, procedures and the responsibilities associated with preparing SSOPs. The SSOP covering LEAP activities has been prepared and reviewed by the Installation Safety Office. Navy LEAP activities will be within the scope of on-going LEAP activities at the range.

CCAFS - The 45th Space Wing is responsible for range safety at CCAFS. DoD Directive 3200.11 and Air Force Regulation 80-28 regulate safety procedures at the range and are the responsibility of the Range Commander. The 45th Space Wing Regulation 127-1 identifies all necessary requirements to meet ground and flight safety requirements at the range.

1.2.7.5 Ship-Board Safety Standards

Any munition intended for Navy ship-board use must pass a series of tests prescribed by Military Standards (MIL-STD-2105A). These tests are designed to represent and demonstrate resistance

to potential ship-board hazards, and ensure safety of flight tests. The test program is approved by Navy WSESRB. The test results are provided to the WSESRB for a final decision of acceptability for shipboard use. Appropriate tests will be conducted with the ASAS and LEAP for certification of use aboard the Terrier ship and operations at Naval Station Roosevelt Roads.

1.3 Alternatives

1.3.1 East Coast Navy Weapons Station, Charleston, South Carolina or Yorktown, Virginia

The SM (Configuration A only) will undergo the standard functional test for SMs prior to being accepted on the Terrier ship and transported to U.S. Naval Station Roosevelt Roads. The Navy plans to conduct this activity at East Coast Navy Weapons Station in Charleston, South Carolina. However, the East Coast Navy Weapons Station in Yorktown, Virginia is being maintained as a program alternative. All appropriate Navy certifications and approvals will be obtained through the Navy Weapons Station. No construction or modification of existing facilities are required to perform these preflight tests. No other Navy Weapons Stations are in use for supporting SM operations on the East Coast.

1.3.2 Solid Divert Propellant for LEAP Projectile

A solid divert propulsion system being developed by Thiokol Corporation, Tactical Operations, Elkton Division is an alternative to the liquid divert propulsion currently used in the LEAP projectile. The solid divert propulsion system does not involve pressurization; it is clean-burning and non-toxic; and involves simplified handling procedures and operations. This system would provide similar delta velocity as the present hypergolic divert motors in the LEAP projectile. A hover test at the National Hover Test Facility, with the solid divert integrated with the Boeing projectile, is scheduled for 1st Quarter, 1993. The solid divert would not be considered for flight test application until completion of a successful hover test with the LEAP projectile. This alternative would consist of a two grain, single pulse propellant consisting of approximately 3.5 pounds of hydroxy-terminated polybutadiene/ammonium perchlorate (HTPB/AP), which is a Hazard Class/Division 1.3, Storage Compatibility Group B propellant.

The LEAP projectile planned for use in flight tests 3-5 would be similar regardless of the divert propulsion system used. The solid divert motor would provide similar kinematic performance with the LEAP projectile as the hypergolic propellant system. No substantial deviations from the trajectories and dispersions are expected. The modifications to the LEAP projectile to accommodate this solid divert motor would be minor (essentially a repackaging of the LEAP non-propulsive components).

1.4 Alternatives Considered But Not Carried Forward

1.4.1 Surface-to-Air Missile for LEAP

The SM is the Navy's primary surface-to-air missile system. This system has replaced older, less capable missile systems and has been designed to be flexible. This system has been continually modified over the past 30 years, and will continue to be modified to adapt to changing needs. It is the only advanced ER surface-to-air missile system currently deployed or planned for future deployment in the fleet. The purpose of the Navy LEAP Technology Demonstration is specifically to demonstrate the capability of integrating LEAP technology with the SM in order to identify critical integration issues for use of these technologies in an operational Navy Anti-Tactical Ballistic Missile (ATBM) system. The Navy has no other extended range surface-to-air missile with the volumetrics or performance capabilities to perform the LEAP exoatmospheric experiments in the near term.

1.4.2 Range Selection

An extensive evaluation process was used to select ranges for the Navy LEAP Technology Demonstration. This process was similar to that used for the LEAP flight test program and is based on experience gained in both previous LEAP and SM range selection efforts. During the process of selecting candidate ranges, international sites were not considered because they presented operational control issues. Sites in the U.S. and its territories were screened to eliminate sites that were known to have significant concerns of availability, limitation of range space, interference from on-going operations, and/or problems associated with security or safety of populated areas. These sites were also reviewed to determine if a SM launch could be performed either from land or ship at sea. This screening resulted in the selection of nine ranges and/or surface missile launch sites, as identified below, which could potentially accommodate Navy LEAP experiments:

- Atlantic Fleet Weapons Training Facility (AFWTF), Puerto Rico
- Cape Canaveral Air Force Station (CCAFS), Florida
- Pacific Missile Test Center (PMTC), California
- Pacific Missile Range Facility (PMRF), Hawaii
- Kwajalein Missile Range (KMR), Marshall Islands
- Wake Island, U.S. Territory
- Wallops Flight Facility (WFF), Virginia
- Mobile Sea Range (MSR)
- White Sands Missile Range (WSMR), New Mexico

Several working sessions were held to narrow down the field of remaining range options. Numerous issues were considered in evaluating the remaining ranges. At the Pre-Conceptual Design Review (Pre-CoDR) held at General Dynamics from 31 March - 1 April, 1992, the range selection working group composed of representatives from appropriate program organizations and several of the ranges convened to select the primary range and potential alternative ranges for

Navy LEAP. Capabilities matrices were developed for each range and compared against several principal requirements. These requirements included: Range Safety Issues; Mission Scenario Realism; Target Launch Support Capability; Launch Scheduling Flexibility; Telemetry, Tracking, and Control Capabilities; and LEAP Test Support Capability. These requirements are described below.

Range Safety Issues—Operating at each of the ranges requires that the program meet specific range safety requirements. Because of potential hazards to people and or facilities, these requirements are more stringent for some ranges than others. A key factor involved with range safety is the FTS requirement imposed by the range. Current SM-2 Block II development rounds do not have a FTS on the booster portion of the missile. The warhead of the SM-2 currently is used to destabilize or terminate the flight of the missile second stage. Any modifications to this system or special requirements imposed by the ranges must be evaluated. The range must be able to accommodate the SM Configuration B which replaces the warhead with the ASAS motor.

Mission Scenario Realism—The range must be able to accommodate mission scenarios which will allow accomplishment of each of the flight objectives. These scenarios must incrementally evolve to an intercept scenario on flight test 5 which is representative of a Theater Ballistic Missile Defense (TBMD) type engagement. The preferred flight test 5 scenario involves a near head-on engagement with an ascending interceptor and descending target or an intercept just past apogee of the interceptor. This type of scenario generally involves fairly large intercept debris footprints because of the high altitudes (greater than 80 kilometers) at which intercept must be performed. This requirement also includes replicating, to the maximum extent possible, shipboard environments and weapon system requirements which would be experienced at sea. These environments are critical to addressing initialization and alignment issues required for Kinetic Energy interceptors.

Target Launch Support Capability—The range must be able to support the launch of the selected target vehicle for the intercept mission on flight test 5 and support any potential rehearsal activities which may take place prior to the intercept.

Launch Scheduling Flexibility—A key objective of the Navy LEAP Technology Demonstration is to demonstrate the potential for incorporating lightweight, hit-to-kill interceptor technologies into the SM system in the near term to significantly contribute to future TBMD decisions. To ensure that the proposed schedule can be met, potential scheduling conflicts must be minimized. For potential shipboard launches, operational fleet assets such as Terrier ships cannot remain in port for more than a few days waiting to perform an experiment and are difficult to reschedule. This requirement suggests that Terrier ships must routinely be available (operate) at the proposed range should launch schedules change.

Telemetry, Tracking, and Control Capabilities—The range must have the capability for adequate missile telemetry, tracking, and control support. This includes data collection capabilities (redundant if required) and can be augmented by mobile assets if possible.

LEAP Test Support Capability—The range must be able to provide and/or accommodate adequate equipment and facilities necessary to properly handle, integrate, and checkout the SM LEAP launch vehicle; to transport and store liquid fuels and oxidizers; to fuel the LEAP projectile; and to load and launch the integrated, fueled SM LEAP launch vehicles.

The capability of the ranges to satisfy the above criteria was evaluated with respect to cost and schedule impacts. Since the LEAP program has a philosophy of minimizing risk by maximizing lessons learned from previous experiments or test programs, another significant consideration was the ability to perform as many of the experiments as possible at the same range and in the same mode (e.g., shipboard or land-based). The result of the evaluation process was the selection of AFWTF and CCAFS as the test ranges. The range selection decision was again revisited at the Interim Progress Review held 7-8 July, 1992 at General Dynamics with the same result.

AFWTF was selected for flight tests 1 - 4 while CCAFS was selected for the intercept on flight test 5. AFWTF and CCAFS were selected because, in conjunction, they meet all of the range selection criteria:

- Flight test 1 - 4 can be flown within the existing AFWTF North (ALFA) weapons range space and easily meet Range Safety and Telemetry, Tracking, and Control requirements. AFWTF/U.S. Naval Station Roosevelt Roads can also sufficiently accommodate load-out of the SM LEAP launch vehicle for the intercept at CCAFS on flight test 5, which enables continued use of established facilities and procedures and minimizes risk, cost, and schedule impacts.

- Fleet exercises involving Terrier and AEGIS ships are routinely conducted at AFWTF, which maximizes launch scheduling and additional data collection opportunities.

- The extensive range area at CCAFS makes it easy to accommodate the preferred engagement scenario on flight test 5.

- Numerous target options, including the Aries Launch Vehicle, have been flown at CCAFS. SLC-20 is an operational pad that has been used to launch several of the selected target candidates including the Aries. CCAFS has also launched more than one Aries within a short turn-around time (Red Tigress 1 and 2) which is important for recycles or re-tests.

- CCAFS has extensive instrumentation both in Florida and the Caribbean (including RF and optical data collection assets) which support Telemetry, Tracking, and Control of the SM and target vehicles. These assets may augment AFWTF on earlier tests.

- Hypergolic fuels are currently stored at U.S. Naval Station Roosevelt Roads for existing Navy AQM targets. Defueling has also been successfully performed there. Established LEAP fueling and handling procedures can be easily accommodated by the existing Navy facilities and activities with minor modifications as determined by the Weapons Departments. SM LEAP launch vehicle handling requirements can also be easily accommodated.

The following paragraphs describe some of the rationale for eliminating the other test range options.

1.4.2.1 Pacific Missile Test Center (PMTC)

PMTC was eliminated primarily because it did not satisfy the Range Safety Issues and Mission Scenario Realism criteria. PMTC, although a frequently used Navy ship range, has a limited ocean range area and restricted flight corridors. Because of the high altitude, long range requirements of the Navy LEAP experiments, these limitations place strict requirements on the FTS (including the capability to destruct the booster, which is not a current capability of the SM) or provide extremely limited options for ship placement. These limitations also hinder the ability to configure a preferred realistic engagement scenario. Although Vandenburg AFB, CA was a promising location for a target launch range in conjunction with PMTC, it has never been used to launch an Aries Launch Vehicle, which means additional program costs and potential schedule impacts would be incurred to accommodate this target. Use of a larger target vehicle such as the Minuteman I or II which has been flown out of Vandenburg AFB was considered, but this option added complexity and cost and did not conform to ABM treaty constraints.

1.4.2.2 Pacific Missile Range Facility (PMRF)

PMRF was eliminated primarily because it did not satisfy the Range Safety Issues and Target Launch Support criteria. There were also some concerns with Tracking, Telemetry, and Control for the long range intercepts. PMRF also has limited ocean range space and is a high traffic shipping area. PMRF, although a SM test range like PMTC, typically does not perform long range intercepts with the SM2 Block II ER. Performing an intercept at PMRF would likely require launch of a target out of Kauai Test Facility (KTF) and launch of the interceptor from a ship outside the range boundaries with intercept occurring at high altitude within range boundaries. Preliminary analysis indicated that this mission could not be performed and meet range safety requirements. Since Kauai does not have the capability to load SMs and cannot dock Navy Cruisers or Destroyers, this would have to be done at Honolulu or on the West Coast, adding additional mission complexity. Although PMRF has launched many different sounding rockets, it has not launched the Aries Launch Vehicle. Developing this capability would have

cost and schedule impacts on the program. Other existing target vehicle options were also considered for PMRF but did not meet requirements. Further, the logistics involved with operating at this distant range, particularly cost and limited schedule flexibility, did not make it an acceptable option.

1.4.2.3 Kwajalein Missile Range (KMR)

KMR was eliminated primarily because it did not satisfy the Launch Scheduling Flexibility and LEAP Test Support Capability criteria. KMR has the capability to launch an Aries Launch Vehicle and is being used for other LEAP flight test experiments; however, KMR has not been used as a SM test range. Terrier ships do not "routinely" operate in this area and it is extremely difficult to schedule them on a one shot basis. Schedule flexibility, therefore, was extremely limited. SMs are not currently processed at Kwajalein. This capability would have to be incorporated, which means handling equipment and procedures would have to be installed, and the ship would have to be able to dock at Meck Island or Kwajalein to have the missile loaded. Destroyers and Cruisers currently cannot dock at Meck where LEAPs are planned to be processed. Docking off-shore adds unreasonable logistics, complexity, and safety concerns. Missile processing and loading at Kwajalein, a small, heavily populated island, requires hypergolic handling and fueling capability which would have to be established there. The option of loading the missile on the West Coast or in Honolulu and sailing to Kwajalein for a single missile technology demonstration launch was also prohibitive using a deployed fleet asset: It occupies too much of the ships time, complicates the missile processing timeliness, and amplifies safety concerns associated with handling a live, fueled LEAP on a ship.

1.4.2.4 Wake Island (Target Launch Vehicle Only)

Wake Island was also eliminated because of similar concerns as KMR including Launch Scheduling Flexibility and LEAP Test Support Capability, as well as the cost and logistics associated with operating at this remote location. Additionally, Wake does not have the capability to launch the Aries Launch Vehicle and has limited data collection capability; therefore, a downrange data collection asset such as the Redstone is required. Although use of a target, such as the Castor IV which is currently being launched out of Wake, would meet target performance and signature requirements, this vehicle would have to be over-ballasted because of velocity constraints. The cost of this vehicle is also greater than desired. In addition, launch schedules on Wake are very tight with only one existing launch pad and many launches scheduled for the current LEAP, BP, and TMD Discrimination programs. Further, hypergolics are presently not allowed on island and there is no capability to handle or launch the SM. Development of these capabilities is schedule and cost prohibitive.

1.4.2.5 Wallops Flight Facility (WFF)

WFF was eliminated from consideration because it did not satisfy Launch Scheduling Flexibility and Mission Scenario Realism criteria. Although Terrier ships do operate in this area, it is not a SM training or test range and it is difficult to schedule repeated one-shot demonstrations for this

range. Previous Navy tests at WFF have met with some difficulty in coordinating support assets from the multiple support organizations. Also, it would be difficult to configure a mission with the preferred, near head-on, ascending interceptor engagement and meet range safety constraints. Several target vehicle options have been launched out of Wallops including the Talos-Aries; however, the Aries Launch Vehicle has not been launched from WFF. Tracking, Telemetry, and Control would have to be augmented by downrange support assets, particularly for the first two flights, which adds scheduling complexity.

1.4.2.6 Mobile Sea Range

The Mobile Sea Range (open ocean) Option was eliminated from consideration because it did not satisfy the Mission Scenario Realism, Launch Scheduling Flexibility, Target Launch Support, and LEAP Test Support criteria. Conducting flight test 5 in the open ocean would not be feasible because launch of the Aries Launch Vehicle or other acceptable target could not be performed without the development of a completely new capability. Flight test 1 - 4 would require multiple downrange ships and support assets which would be prohibitive because of cost and scheduling constraints. Additionally, missile processing timeliness and requirements including detailed pre-launch integration testing which is currently planned for land could not be conducted using only ship-based assets. The MSR requires extended time at sea prior to launch.

1.4.2.7 White Sands Missile Range

WSMR has been used extensively for SM and LEAP program activities. WSMR was considered a strong candidate for flight tests because other LEAP flight tests have occurred there. In addition, WSMR has the necessary instrumentation and data collection capability necessary to support Navy LEAP tests. WSMR was eliminated from further consideration because it did not meet the demonstration requirements of supporting range safety issues and mission scenario realism for all flights, and target launch support capability for flight test 5. This determination was made based on dispersion analyses performed after the Pre-CoDR meeting.

The dispersion analyses for all flights demonstrated that hazard patterns and debris dispersion footprints could not be kept on the range. This was due to the SM modifications to support Navy LEAP and the intercept altitudes required to demonstrate mission scenario realism. Flight tests at WSMR would require modification of the flight tests to keep debris dispersion areas on range. The higher elevation angles required to keep the missile on range caused subsequent concerns related to the ability to control the missile at high altitudes. In addition, the high altitude launch would result in debris dispersion footprints that would likely include habitat for threatened and endangered species on range.

1.4.3 Target Launch Vehicle Selection

Navy LEAP target options for flight test 5 are constrained by ABM Treaty limitations, range compatibility, LEAP performance, and LEAP mission objectives. The primary target requirements considered for Navy LEAP target selection are listed below:

- Minimum target velocity of 2 kilometers/second; maximum of 3 kilometers/second (helps ensure ABM Treaty compliance)
- Minimum target exoatmospheric flight time of 5 minutes
- Targets have an approximate diameter of 1 meter
- Targets must have adequate radio frequency (RF) and IR signature for LEAP engagement

Many target launch vehicles were initially considered, including sounding rockets, commercial motors, and government furnished boosters. The following target vehicles were able to meet LEAP requirements:

- Aries I (M56A1)
- Aries (M56A1)/Orbus
- Aries II (M56A1 and M57A1)
- Sergeant/M57A1
- Talos/M57A1
- Castor IVA
- Talos/Sergeant/Orbus
- Talos/Sergeant/M57A1

Evaluation criteria for these candidate vehicles included range boundary restrictions, target support capability, target complexity, cost, availability, and accuracy requirements to perform the mission. The three stage vehicles were eliminated because of unnecessary complexity and mission risk as well as maximum velocity. Several vehicles would have to be significantly modified to meet velocity and signature requirements. The vehicles that best meet the selection criteria are the Aries Launch Vehicles.

The Aries Launch Vehicle (Aries I or II) has been selected as the Target Launch Vehicle for the Navy LEAP target launch at CCAFS. The Aries I has been flown at CCAFS (SLC-20) and Aries II can also be supported at this site. Aries I has adequate performance to meet program objectives and satisfy ABM treaty requirements. The Aries I can be maintained within the 2 - 3 km/second intercept velocity requirement with minimal ballast. It also has the advantage of being a single-stage vehicle, which will lower mission risk, cost, and complexity.

1.5 No Action

The No Action alternative for Navy LEAP Technology Demonstration is to not conduct the Navy LEAP Technology Demonstration. Flights associated with Navy LEAP would not occur at AFWTF, WSMR, or CCAFS. The No Action alternative is not preferred because it would preclude a series of flight tests that are needed to demonstrate the feasibility of using Navy shipboard weapon systems with LEAP technologies for exoatmospheric flight.

Existing Conditions 2.0

2.0 Existing Conditions

The existing conditions encompass the physical attributes of locations that potentially are affected by the proposed action and no action alternative. Existing conditions include the physical setting at each location, as well as air quality, threatened and endangered species, noise, and safety considerations. For the Navy LEAP EA, the pertinent locations include off-site contractor facilities associated with SM and LEAP component fabrication and development, and on-site locations for ground, preflight, and flight tests. The LEAP EA, LEAP Supplemental EA, STANDARD Missile EA, Single Stage Rocket Technology (SSRT) EA, Project Starbird EA, Starlab Program EA, and Red Tigress EA provide general information on the existing conditions at each location; therefore, information from these documents is incorporated by reference, where appropriate.

2.1 Component Assembly/Ground Test Locations

Information regarding the technical operations of component assembly/ground test participants in the Navy LEAP Technology Demonstration was obtained from questionnaires distributed to contractor facilities. These contractors are General Dynamics, Thiokol Corporation, Boeing Aerospace and Electronics, Hughes Aircraft Corporation, and Rockwell International. The goal of the questionnaires was to identify current facility activities, the existing environment, activities pertaining to Navy LEAP, and the status of environmental compliance.

The questionnaire required specific information from contractors on environmental and safety documentation (including permits), RCRA/Superfund status, and potential to impact the following environmental resources: physical setting and land use, water resources, geology and soils, air quality, noise, biological resources, threatened and endangered species, cultural resources, infrastructure, hazardous materials and wastes, and human health and safety. Not all environmental media applied to each contractor facility location reviewed. The information collected from the contractor facilities is summarized in Sections 2.1.1 through 2.1.5 below.

2.1.1 General Dynamics

As identified in Section 1.2.3.1, General Dynamics will conduct design and systems integration tasks for the SM-2 ER Terrier Missile at their facility in Pomona, California. The Pomona facility consists of 20 buildings on approximately 167 acres located in an urban area surrounded by residential and industrial land uses. Navy LEAP activities will be conducted in Buildings 2 and 4, and will occupy approximately 3.1 percent of these buildings. General Dynamics will require 80 employees at the peak of the program (a total of 2,500 personnel are employed at General Dynamics); however, no additional employees, new structures, or modifications to existing facilities will be required to accommodate Navy LEAP activities. In addition, the facility will not require decommissioning following Navy LEAP activities (Ref #23).

The facility has existing environmental permits and an existing safety plan that will cover activities performed for Navy LEAP (Ref #23). Shipments to and from General Dynamics for Navy LEAP will occur by highway (trucks) and air transportation per 49 CFR.

2.1.2 Thiokol Corporation

As identified in Section 1.2.3.3, Thiokol Corporation, Elkton Division, will conduct ASAS motor design and development testing at the Elkton, Maryland facility. The facility is in a rural area surrounded by industrial, commercial, agricultural, and residential land uses. The 500 acre complex consists of 230 buildings and 504 personnel. Approximately 10 additional personnel will be required for Navy LEAP activities. Existing buildings will be used (C-52, A-66, C-26, G-20, G-18, and C-20A) and no construction/modifications will be necessary. Navy LEAP activities will be covered by existing environmental permits. Wetlands, aquifers, and floodplains are located on-site, but none of these resources have been cited as areas of concern (Ref #27).

A safety directive, Emergency and Disaster Plan, and a Field Handling Manual will regulate the activities for the Navy LEAP program. Shipments to and from Elkton will occur via commercial/temperature controlled trucks regulated by DOT. Decommissioning of facilities will not be required because they will be used for on-going activities.

2.1.3 Boeing Aerospace and Electronics

As identified in Section 1.2.3.2, Boeing Aerospace and Electronics Company will design and fabricate LEAP vehicles and components in the Kent, Washington facility. The 431 acre facility is located in an urban area, surrounded by commercial/manufacturing land uses. It consists of 45 buildings and employs 8,000 personnel. No additional personnel will be required for Navy LEAP activities. Existing buildings 18-05 and 18-24 will be used and no modifications to these structures will be required. Existing environmental permits will cover activities for the Navy LEAP Technology Demonstration. Wetlands and floodplain areas are present at the facility. Although wetlands have been cited as an area of concern at the facility, they will not be affected by Navy LEAP activities (Ref #46).

An existing safety plan will cover activities for Navy LEAP. Shipments to and from the facility for Navy LEAP activities will occur by truck. Decommissioning of facilities following Navy LEAP activities will not be required because they will be used for on-going activities.

2.1.4 Hughes Aircraft Corporation, Missile Systems Group

As identified in Section 1.2.3.2, Hughes Aircraft Corporation will design and fabricate LEAP vehicles and components. Component production and assembly will occur at a missile manufacturing complex in a rural/industrial area of Tucson, Arizona consisting of 21 buildings housing manufacturing and engineering activities. Hughes will perform subsystem and system

level integration and testing at the engineering facility in Canoga Park, CA. This facility is located in a suburban area northwest of Los Angeles, and consists of 12 main buildings housing engineering, integration laboratories, and test facilities.

Navy LEAP activities will use proven technology and are similar to other activities historically performed at these facilities. The two facilities combined employ approximately 6,000 personnel. No additional personnel or facility construction/modifications will be required. Existing environmental permits and safety programs will cover Navy LEAP activities at both facilities. Both facilities operate above aquifers, and the aquifer under the Tucson site has been contaminated and is being treated using a Groundwater Treatment Plant.

Hazardous/toxic materials will be handled per Hughes' hazardous materials management program. Both facilities have RCRA permits. Shipments to and from the facilities will occur by DOT regulated surface and air transportation. Decommissioning of facilities will not be required because they will be used for on-going activities. (Ref #47).

2.1.5 Rockwell International, Rocketdyne Division

As identified in Section 1.2.3.2, Rockwell will design and fabricate LEAP vehicles and components at its Canoga Park, California facility. The facility encompasses 69.4 acres and 21 buildings surrounded by commercial, industrial, and multi-residential land uses. The facility employs approximately 2,700 personnel. No new personnel will be required to support the program.

Similar programs have been conducted at the Rocketdyne facility for the past 30 years. Existing environmental permits will support Navy LEAP activities. An aquifer is present on-site. Small amounts of wastes defined as hazardous will be created during program activities, however, the wastes are not treated on the facility and a RCRA permit is not required. All activities at the facility are covered under the *Rocketdyne Health and Safety Program Plan* and the *Rocketdyne Health and Safety Procedures Manual* (Ref #47).

2.2 Preflight and Flight Test Locations

Preflight activities are planned at General Dynamics, WSMR, East Coast Navy Weapons Station (SM Configuration A only), and U.S Naval Station Roosevelt Roads. Flight tests are planned within the jurisdiction of AFWTF, U.S. Naval Station Roosevelt Roads, and CCAFS.

2.2.1 General Dynamics

The existing conditions for General Dynamics for preflight activities are described in Section 2.1.1.

2.2.2 White Sands Missile Range

As identified in Section 1.2.4.3, integration of the ordnance components of the SM will occur at WSMR prior to shipment for flight tests. These activities will take place in Building 300, which is maintained for this purpose. Various versions of the SM family have been tested at White Sands since its development in the early 1950's. The SM program was analyzed in the SM EA. A complete assessment of the affected environment for the program is found in Section 2 of that EA. In addition, a complete assessment of the affected environment for LEAP activities at WSMR can be found in Section 2 of the LEAP EA. Both documents are incorporated into this EA by reference. Navy LEAP activities at WSMR will be consistent with the proposed action in the SM EA.

2.2.3 East Coast Navy Weapons Station

East Coast Navy Weapons Station is located in Charleston, South Carolina. The existing conditions for the East Coast Navy Weapons Station will not be discussed because the preflight activities at this facility only involve the missile standard functional tests prior to being accepted on the Terrier ship. The activities are consistent with practices to support SM operations on a routine basis at the facility.

2.2.4 U.S. Naval Station Roosevelt Roads

Naval Station Roosevelt Roads was commissioned as a naval operating base in 1943. It is one of the world's largest and most advanced training ranges and encompasses active sites on Puerto Rico, the island of Vieques, and St. Thomas and St. Croix, U.S. Virgin Islands (Ref #33). The mission of Naval Station Roosevelt Roads is to maintain and operate facilities and provide services and materials to support fleet training operations of naval aviation units and units of the surface and subsurface forces of the Navy, Marine Corps, and others (Ref #40).

In 1963 AFWTF was commissioned as a separate activity. In addition to AFWTF, Naval Station Roosevelt Roads is tenant to three other commands: Commander United States Naval Forces Caribbean; Commander Fleet Air Caribbean; and Commander Southern Atlantic Force (Ref #40). The Commanding Officer, U. S. Naval Station Roosevelt Roads, is responsible for daily activities and security at Naval Station Roosevelt Roads (Ref #40).

2.2.4.1 Physical Setting and Land Use

Naval Station Roosevelt Roads occupies approximately 8,627 acres on the eastern coast of Puerto Rico. Approximately 90 percent of the station is located within the Municipality of Ceiba, and 10 percent is located within the Municipality of Naguabo (Ref #40). This area of Puerto Rico is mainly rural. The largest town in the vicinity of the naval station is Fajardo, located approximately 10 miles north of the naval station (Ref #40). San Juan, the capital of the Commonwealth, is located approximately 40 miles northwest of the naval station.

The primary land uses at Naval Station Roosevelt Roads include Fort Bundy (a deactivated fort), an airfield (Ofstie Field), and a waterfront/industrial zone. Land is also leased to Federal agencies, local governments, and individuals. In general, dominant land uses involve wildlife sanctuaries (mangroves), operations, community facilities, and training areas (Ref #40).

Building 380, to be used for fueling activities, is located adjacent to the Ofstie Field in the northwest portion of Naval Station Roosevelt Roads on land classified as "improved". This existing building is a structure approximately 20 feet wide by 60 feet long by 15 feet high, and is currently used to store and process (attach fins, pressurize, etc.) AQM missiles for launch. It is located on, and surrounded by, impervious asphalt. The Ready Service Lockers, to be used for propellant storage, are located approximately 2,000 feet south of the airfield off Corregidor Road. These existing lockers are approximately 8 feet wide by 10 feet long by 8 feet high, are not currently in use, and are located on land classified as "semi-improved" (Ref #40).

2.2.4.2 Water Resources

Surface Water - Water drainage patterns at Naval Station Roosevelt Roads are strongly influenced by drainage areas off-base on the western portion of the station. Hills in this area are steeply sloped and receive heavy rainfall. Some areas in the station can not handle the large volumes of water during heavy rains, resulting in ponding, erosion, and flooding (Ref #40). There are no surface water resources at Building 380 or the Ready Service Lockers.

Floodplains - The propellant storage area (Ready Service Lockers) and fueling area (Building 380) are not located within the 100-year floodplain (Ref #40).

Groundwater - The groundwater at the station is generally acceptable for most industrial, commercial, and residential uses, although calcium, bicarbonate, and magnesium ions predominate (Ref #46). Groundwater at the naval station is not used as a source of drinking water.

2.2.4.3 Topography, Geology, and Soils

Topography - Elevations at Naval Station Roosevelt Roads range from sea level at the coast to approximately 297 feet in the southwest portion of the naval station. The topography ranges from hills, to broad flat valleys, to coastal plains (Ref #40). Three sets of ridges delineate the station: hills on the southwestern part of the station in the Fort Bundy area; hills in the central part of the naval station; and hills within the harbor and industrial areas.

Regional Geology - The geology at Naval Station Roosevelt Roads is primarily volcanic rock consisting of tuff, breccia, and lava interbedded by sedimentary rocks (Ref #33). The northwestern and western areas of the naval station are also underlain by unconsolidated alluvial and old alluvial deposits from the Quaternary period (Ref #33).

Soil Resources - The soils at Naval Station Roosevelt Roads can be classified into six associations. The soils at Building 380 and the Ready Service Lockers are classified as the Mabi-Rio Arriba-Cayagua Association (Ref #40). Neither location is prone to soil erosion. This soil association occurs on foot and side slopes, terraces, and alluvial fans, and in areas with slopes of 2 to 12 percent. The Mabi and Rio Arriba soils are the most prevalent soils in the association at Naval Station Roosevelt Roads, and both occur on terraces and alluvial fans. Mabi soils tend to be deep and rather poorly drained, while Rio Arriba soils are deep, moderately well drained, and occur on steeper slopes (2 to 5 percent). The soils of this association have limited recreational and urban use because of a high to very high shrink-swell potential and slow permeability (Ref #40).

2.2.4.4 Biological Resources

Vegetation - The unimproved areas at Naval Station Roosevelt Roads (approximately 58 percent of the station) consist of upland forest, mangrove, or beach strand vegetation (Ref # 40). Upland forests are characterized by dense stands rarely exceeding 40 to 50 feet. Mangrove areas consist of red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia nitida*), and white mangrove (*Laguncularia racemosa*) (Ref #40). Riverine, fringe, and basin forest mangrove associations exist at Naval Station Roosevelt Roads. Mangrove forests occupy approximately 23 percent of the naval station. Building 380 and the Ready Service Lockers lack vegetation resources.

Terrestrial Wildlife - Puerto Rico is not abundant in wildlife, but over 200 species of birds inhabit the island. Approximately 100 of these species can be found at the naval station. Due to a lack of habitat at Building 380 and the Ready Service Lockers, terrestrial wildlife is not present at these sites.

Aquatic Resources - Water resources at Naval Station Roosevelt Roads are described in Section 2.2.1.2. The only aquatic resources at the naval station would be associated with the wetland and ocean areas, since perennial streams or ponds/lakes are not present. Neither Building 380 or the Ready Service Lockers are located in areas with aquatic resources.

Wetlands - Wetlands at Naval Station Roosevelt Roads include the mangroves present on the coast of the station. Building 380 and the Ready Service Lockers are not located in wetland areas.

2.2.4.5 Threatened and Endangered Species

Threatened and endangered reptiles, birds, and mammals are reported to occur on Naval Station Roosevelt Roads. A species list is shown in Exhibit 2.2. Critical habitat areas are illustrated in Exhibit 2.3. Of these species, the yellow-shouldered blackbird (*Agelaius zanthomus*) and the West Indian manatee (*Trichechus manatus manatus*) reside within the naval station. Section 7 consultation under the Endangered Species Act with the U.S. Fish and Wildlife Service is required for development in areas of yellow-shouldered blackbird critical habitat. The yellow-shouldered blackbird breeds and nests on the naval station and critical habitat has been designated

Species	Status*	
	Federal	Commonwealth
Reptiles		
Green turtle	T	E
Hawksbill turtle	E	E
Leatherback turtle	E	E
Puerto Rican boa	E	E
Birds		
Yellow-shouldered blackbird	E	E
Brown pelican	E	E
Peregrine falcon	E	E
Snowy plover	—	V
West Indian whistling duck	—	V
Caribbean coot	—	V
Ruddy duck	—	V
Least tern	—	V
Piping plover	E	—
Mammals		
West Indian manatee	E	E

Exhibit 2.1 ***Threatened and Endangered Species Reported to Occur on U.S. Naval Station Roosevelt Roads***

* T = threatened; E = endangered; and V = vulnerable

Source: Reference #40

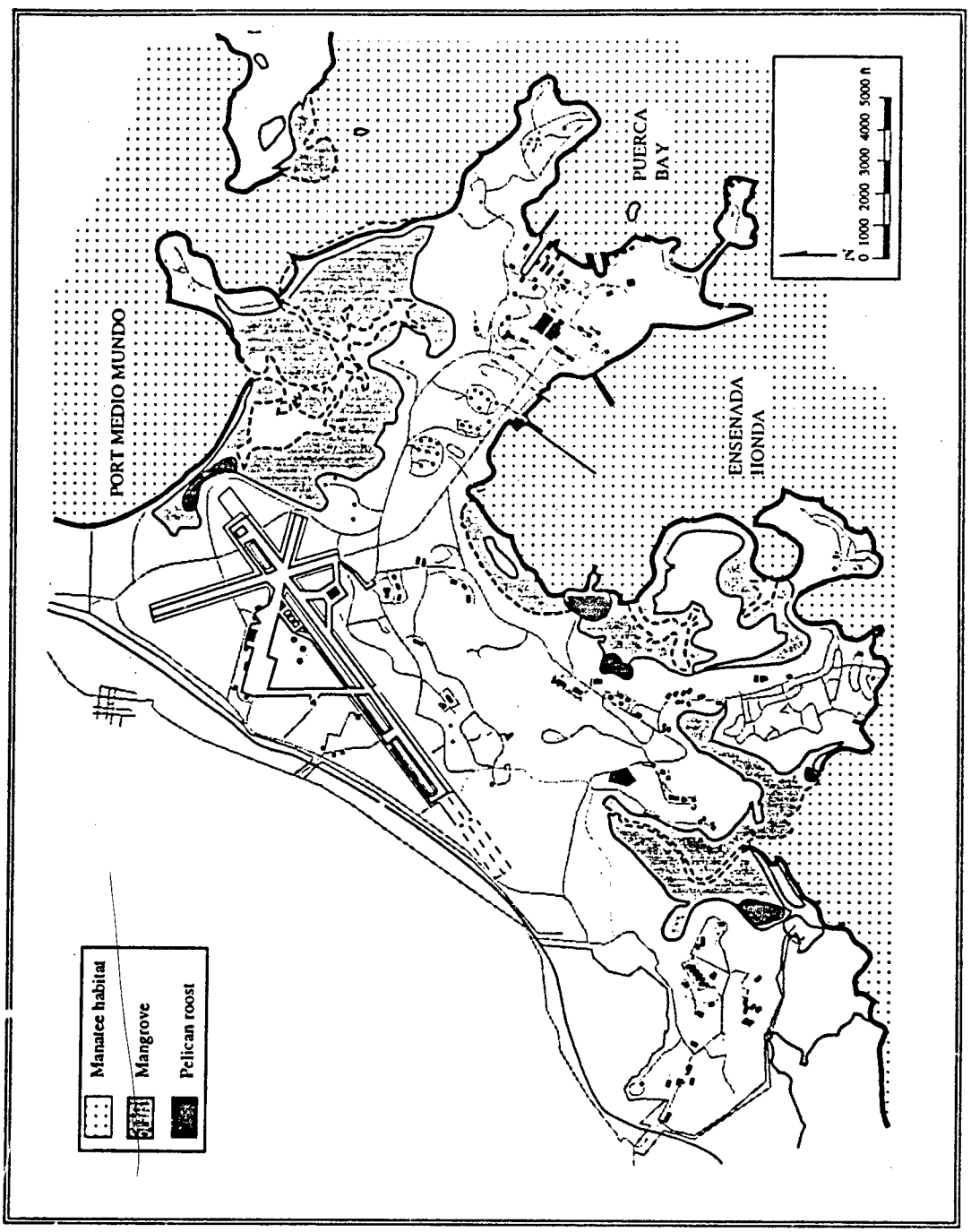

Exhibit 2.2: Critical Habitat at U.S. Naval Station Roosevelt Roads
Source: SDIO, 1992.

at the naval station (Ref #40). Propellant storage and fueling activities will not occur within critical habitat areas. All marine turtles in the naval station area are endangered. No threatened or endangered plant species are known to occur at Naval Station Roosevelt Roads (Ref #40).

2.2.4.6 Cultural Resources

Cultural resources are present on the naval station. Building 380 is located on an impervious surface and the Ready Service Lockers are located in areas that have been disturbed. No construction/modifications to these structures will be required.

2.2.4.7 Air Quality

Climatological Conditions - Naval Station Roosevelt Roads has a tropical-marine climate, with an annual mean temperature of 79.9 degrees F, relatively moderate humidity, and frequent rainfall. Average annual rainfall is approximately 58 inches, and the rainy season occurs from May to November. Easterly trade winds occur all year. Tropical cyclones are prevalent during the summer and early fall.

Ambient Air Quality - Naval Station Roosevelt Roads is located within the Puerto Rico Air Quality Control Region (AQCR). The Puerto Rico Environmental Quality Board (EQB) and Region II of EPA are jointly responsible for the ambient air quality program. The Commonwealth has adopted the National Ambient Air Quality Standards (NAAQS) for the six criteria pollutants: nitrogen oxide, sulfur dioxide, carbon monoxide, ozone, PM 10 (suspended particulates less than 10 microns in diameter), and lead (Ref #33). The air quality at the naval station is in attainment for these pollutants (Ref #33).

2.2.4.8 Noise

Noise is defined as undesirable sound. Noise is generated by activities associated with Ofstie Airfield. An AICUZ study has been completed at Naval Station Roosevelt Roads. Building 380 and the Ready Service Lockers are located in Noise Exposure Zone 3, with an LdN of 75 (Ref #46).

2.2.4.9 Infrastructure

Electricity is supplied by the Puerto Rico Electric Power Authority. Potable water originates from the Rio Blanco watershed 17 miles west of Naval Station Roosevelt Roads. Three waste water treatment plants provide secondary treatment and discharge into coastal waters at the naval station.

2.2.4.10 *Hazardous Materials and Wastes*

Hazardous wastes generated at the facility or aboard ship that require disposal are collected by the Public Works Department and disposed of in accordance with federal safety and environmental regulations. Building 1973 is maintained as a secure holding facility for all hazardous wastes (Ref #46).

2.2.4.11 *Human Health and Safety*

A complete discussion of the requirements and steps to protect human health and safety is located in Section 1.2.7.4.

2.2.5 Atlantic Fleet Weapons Training Facility

AFWTF is a tenant of the U.S. Naval Station Roosevelt Roads, with a mission to operate, maintain, and develop training of fleet forces and other activities, and for the development, test and evaluation, on a reimbursable basis, of weapons systems. This command will be responsible for flight test activities in the ALFA Range. As a tenant, the existing conditions for Naval Station Roosevelt Roads would normally be applicable to AFWTF as well; however, AFWTF activities for the Navy LEAP Technology Demonstration do not involve land-based activities, and will only involve ship-board activities and the actual flight tests over the open ocean. Therefore, only the existing conditions for open ocean in the ALFA Range is applicable for AFWTF (i.e., potential threatened and endangered species).

2.2.6 Cape Canaveral Air Force Station

2.2.6.1 *Physical Setting and Land Use*

NASA's Kennedy Space Center (KSC) and the 45th Space Wing's CCAFS are located adjacent to each other on the central east coast of Florida in Brevard County. The Space Center supports the Space Shuttle and CCAFS supports unmanned commercial, as well as military, launches. CCAFS is located on a barrier island approximately 4.5 miles wide and consists of approximately 15,800 acres (Ref #44). CCAFS supports DoD, NASA, and commercial users by providing launch, tracking, and other facilities (Ref #44). It consists of a series of launch complexes on the east coast of the island, with support facilities on the central and western part of the island. Facilities include an industrial area and an Air Force Space Museum. Total facilities occupy approximately 30 percent of the island; the rest is undeveloped (Ref #44).

SLC-20 is located on the coast of CCAFS and was recently renovated for the Starbird project. It was constructed in 1957, and was recently used for the Starlab program. SLC-20 is approximately 20 acres in size, located 1200 feet from the ocean. It consists of two pads, a blockhouse, a payload assembly building, a launch stand and ramp, a deluge water basin and drainageway, and is encircled by a road (Ref #29).

2.2.6.2 Water Resources

Surface Water - Water bodies surrounding CCAFS include the Banana River to the west, the Atlantic Ocean to the east, and drainage canals throughout the CCAFS area. Mosquito control dikes and ditches were constructed parallel to the Banana River shoreline to drain marshes. Surface water quality in the Banana River near CCAFS has been classified as good. Water quality of other nearby water resources such as the Merritt Island Wildlife Refuge, Canaveral National Seashore, and the Banana River Aquatic Preserve are classified as Outstanding Florida Waters (Ref #44). The Indian River Lagoon System has been classified by EPA as an Estuary of National Significance, granting it special protection. There are no freshwater resources on SLC-20 (Ref #44).

Groundwater - The Floridan limestone aquifer underlies the coastal basins of Florida, under shallow sand or sand and shell aquifers (Ref #31). Groundwater in Brevard County is represented by both confined and unconfined aquifers, and the Floridan aquifer provides the largest supply of potable groundwater. Groundwater quality at CCAFS is considered non-potable due to its high salinity (Ref #31).

2.2.6.3 Geology and Soils

Geology - CCAFS is located on a barrier island which consists of relict beach ridges overlying limestone formations several thousand feet thick (Ref #44).

Soils - Shell, limestone, and sand are the constituents comprising the five general soil associations found at CCAFS (Ref #30). The soils at CCAFS are typically well-drained sandy soils with shell fragments, rapid permeability, and low available water capacity (Ref #44). These soils have low organic matter content.

SLC-20 soils are classified as the Canaveral-Palm Beach-Welaka Association, which consists of nearly level to gently sloping moderately well-drained to excessively drained sandy soils (Ref #30). Canaveral soils are excessively drained and are located on narrow ridges and sloughs parallel to the Atlantic Ocean. Palm Beach soils are also excessively drained with high permeability and are located on dunelike ridges parallel to the Atlantic Ocean. Welaka soils are nearly level and well drained, located on moderately broad ridges interspersed with long narrow sloughs (Ref #30). These soils are not suitable for agriculture.

2.2.6.4 Biological Resources

Vegetation - CCAFS consists primarily of coastal scrub, strand, and dune vegetation (Ref #44). SLC-20 and the missile assembly building are located primarily in coastal scrub habitat, represented by scrub oak (*Quercus chapmanii*), wax myrtle (*Myrica cerifera*), and wild grapes (*Vitis sp*). Common strand vegetation includes wax myrtle (*Myrica cerifera*) and saw palmetto

(*Serenoa repens*) (Ref #45). Coastal dune vegetation is found closest to the ocean, consisting primarily of grasses (i.e., sea oats (*Uniola paniculata*)) and shrubs (i.e., beach berry (*Scaevola plumieri*)) (Ref #45).

Terrestrial Wildlife - CCAFS is abundant in wildlife, including gulls, terns, sandpipers, and endangered sea turtles (Ref #44). The coastal scrub and strand vegetation provides habitat for such species as scrub jay (*Aphelocoma coerulescens*), indigo snake (*Drymarchon corais*), gopher tortoises (*Gopherus polyphemus*), Eastern diamondback rattlesnakes (*Crotalus adamanteus*), white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), barn owls (*Tyto alba*) and many other birds and mammals (Ref #29). Few wildlife species are present at Launch Complex 20, but the gopher tortoise, a species of special concern in the State of Florida, and the scrub jay, a Federal threatened species, are resident species (Ref #44).

A list of Cape Canaveral biological resources can be found in Appendix F of the Starbird EA.

Aquatic Resources - CCAFS is a barrier island, surrounded by a multitude of water resources, as described in Section 2.2.3.2. These resources have abundant aquatic resources, including endangered sea turtles, as discussed in Section 2.2.3.5. In addition, the Indian and Banana Rivers and Mosquito Lagoon are estuaries that serve as nurseries and provide habitat for birds, fish, shellfish, and sport fish (Ref #30).

Wetlands - CCAFS contains approximately 20 acres of freshwater wetlands, 450 acres of mangroves, and 140 acres of salt marsh. Wetlands are not present near SLC-20 (Ref #44).

Floodplains - CCAFS contains both 100 year and 500 year floodplains; however, SLC-20 is not located within either of the designated floodplains.

2.2.6.5 Threatened and Endangered Species

Threatened species utilizing CCAFS are listed in Exhibit 2.4. Species known to occur or likely occur in the immediate area of SLC-20 include the indigo snake, southeastern beach mouse (*Peromyscus polionotus niveiventris*), and scrub jay (Ref #29). The indigo snake usually cohabits in gopher tortoise burrows. As discussed in the Starlab EA, it is unlikely for the other species listed in Exhibit 2.5 to be present in the vicinity of SLC-20 due to a lack of suitable year-round habitat. The Banana River, which borders CCAFS to the west, is considered critical habitat for the endangered West Indian manatee.

Although SLC-20 supports few threatened and endangered species, nearby beaches are prime nesting habitat for loggerhead threatened turtles (*Caretta caretta*) (Ref #44). Leatherback turtles (*Dermochelys coriacea*) are occasional nesters on CCAFS. The turtles make nests above the high-tide line at night between April and September (Ref #44). Hatchlings can become disoriented by onshore lighting and move inland instead of to the ocean. To prevent hatchling mortality, CCAFS environmental policies include that all exterior lights will be low pressure

Species	GFWFC[1,2]	USFWS[3]
Fish		
Saltmarsh topminnow (*Fundulus jenkinsi*)	SSC	
Reptiles		
American alligator (*Alligator mississippiensis*)	SSC	T (S/A)
Atlantic green turtle (*Chelonia m. mydas*)	E	E
Atlantic loggerhead turtle (*Caretta caretta*)	T	T
Eastern indigo snake (*Drymarchon corais*)	T	T
Gopher tortoise (*Gopherus polyphemus*)	SSC	UR2
Leatherback turtle (*Dermochelys coriacea*)	E	E
Birds		
Arctic peregrine falcon (*Falco peregrinus tundrius*)	E	T
Bald eagle (*Haliaeetus leucocephalus*)	T	E
Florida scrub jay (*Aphelocoma coerulescens*)		T
Little blue heron (*Egretta caerulea*)	SSC	
Osprey (*Pandion haliaetus*)	SSC	
Roseate spoonbill (*Ajaia ajaja*)	SSC	
Snowy egret (*Egretta thula*)	SSC	
Wood stork (*Mycteria americana*)	E	E

Exhibit 2.3 Threatened and Endangered Species and Species of Special Concern at CCAFS

Species	GFWFC[1,2]	USFWS[3]
Mammals		
West Indian manatee (*Trichechus manatus latirostris*)	E	E
Florida mouse (*Peromyscus floridanus*)	SSC	UR2
Southeastern beach mouse (*Peromyscus polionotus niveiventris*)		T
Protected Plants		
Giant leather fern (*Acrostichum danaeifolium*)	T	
Black mangrove (*Avicennia germinans*)	4	
Red mangrove (*Rhizophora mangle*)	4	
Sea oat (*Uniola paniculata*)	4	

Exhibit 2.3 Continued

Notes

1. E = endangered
   T = threatened
   SSC = species of special concern
   UR = under review
2. Game and Fresh Water Fish Commission (State of Florida)
3. U.S. Fish and Wildlife Service
   S/A = Similarity of Appearance
4. These species protected under separate State and Federal laws

sodium fixtures unless otherwise justified; all lights visible from the beach will be shielded; and photo cells must be justified and equipped with an over-riding manual switch (Ref #48). Lighting at SLC-20 must comply with the U.S. Fish and Wildlife Approved Light Management Plan for this complex.

2.2.6.6 Cultural Resources

CCAFS is a national historic landmark district made up of the following seven discontiguous sites: Mission Control Center Facility #1385; Complex 5/6 and 26 (Air Force Space Museum);

Complex 13 (Mobile Service Tower); and Launch Complexes 14, 19, and 34 (Ref #48). SLC-20 is located between Launch Complexes 34 and 19. Twelve archaeological sites (burial mounds and middens) have been identified and are listed on the state register (Ref #48). Cultural resources for CCAFS are addressed under Air Force Regulation 126-7, Historic Preservation.

SLC-20 and the adjacent areas have been highly disturbed in the past, and it is unlikely that any historic or archaeological resources are present (Ref #44). In 1988, the Florida State Historic Preservation Officer ruled that SLC-20 was not eligible for listing on the National Register of Historic Places because of heavy disturbances to the facility (Ref #80).

2.2.6.7 Air Quality

Climatological Conditions - The temperature and humidity at CCAFS remains relatively constant throughout the year. Average daily maximum temperatures range from 69 degrees F in January to 88 degrees F in July (Ref #44). Average annual precipitation is 45 inches, with a maximum in September, and a minimum in April. The coastal climate is typified by easterly winds by day and westerly winds at night (Ref #44).

Ambient Air Quality - Facilities operating in Florida must meet Florida ambient air quality standards (sulfur dioxide and PM-10 are more stringent than Federal standards) for the six criteria pollutants. CCAFS lies within an "attainment" area. Air quality at CCAFS is influenced by NASA operations, land management practices, vehicular traffic, and emission sources outside of CCAFS (Ref #45). Space launches at KSC are episodic events. Ambient air quality is monitored by two permanent stations, and KSC has had periodic exceedances of nitrogen dioxide and sulfur dioxide (Ref #45). Of all the criteria pollutants ozone has the highest concentration at KSC, but ozone levels do not exceed Florida standards (Ref #45).

2.2.6.8 Noise

The 24-hour average ambient noise level at KSC is below the EPA recommended upper level of 70 dBA. Noise at KSC is generated from Orbiter reentry sonic booms; launches; aircraft movements; industrial operations; construction; and traffic (Ref #45).

2.2.6.9 Hazardous Materials and Wastes

CCAFS generates approximately 400,000 pounds of hazardous waste annually. Hazardous waste management includes accumulation sites, storage sites, inspection, disposal, and record keeping (Ref #48). Waste management at CCAFS must comply with Federal, state, local, and Air Force regulations as well as 45th Space Wing OPlan 19-14, Petroleum Products and Hazardous Waste Management Plan.

2.2.6.10 *Human Health and Safety*

A complete discussion of the requirements to protect human health and safety is located in Section 1.2.7.4.

Consequences 3.0

3.0 Consequences

The purpose of this section is to identify potentially significant impacts, if any, resulting from implementing the proposed action and the no action alternative. The consequences of implementing the proposed action are described in Sections 3.1 and 3.2, and the consequences of implementing the no action alternative are described in Section 3.3.

The methodology employed to identify potential impacts, if any, of implementing the proposed action or no action alternative involved three phases. First, a determination was made, after implementation of the engineering/environmental practices and safety measures described in Section 1.0, whether the proposed action would result in any impacts to the environmental resources described in Section 2.0.

In the second phase, it was determined if these impacts were potentially significant, as defined in 40 CFR Part 1508.27. The emphasis is to determine both the context in which the action will occur and the intensity of the action. The action was reviewed in the context of various laws and regulations to determine if impacts exceeded defined threshold levels (e.g., NAAQS, etc.). Potential impacts resulting from implementing the proposed action that did not meet these criteria for a potentially significant impact were considered to have no significant impacts on the evaluated resources.

Finally, for any impacts from the proposed action that were potentially significant, it was determined whether mitigation measures could be implemented to reduce the impacts to less than significant levels. As previously stated, the environmental consequences of implementing the LEAP Test Program have been previously assessed in the LEAP Test Program EA and the LEAP Supplemental EA. Both documents resulted in a FONSI. Moreover, the environmental consequences of SM activities at WSMR have been assessed in the STANDARD Missile EA. Where appropriate, the findings of these documents have been incorporated into this EA to avoid unnecessary duplication in analysis.

3.1 Proposed Action - Site-Specific Analysis: Component Assembly/Ground Test Locations

The environmental questionnaire distributed to the engineering contractor facilities as described in Section 2.1 was used to evaluate the compatibility of LEAP and ASAS technologies and required activities with the environment at those facilities and current facility activities. The findings of the analyses are summarized in Sections 3.1.1-3.1.5 below.

3.1.1 General Dynamics

As identified in Section 2.1.1, the General Dynamics Pomona facility will not require modification for the proposed action. The activities are routine activities at the facility, and all required environmental permits and safety procedures are in place. As identified in Section 2.1.1, no sensitive environmental resources are present at the facility. Therefore, the analysis demonstrates that the proposed action will have *no significant impacts* to existing environmental conditions at the facility.

3.1.2 Thiokol Corporation

As identified in Section 2.1.2, similar activities have occurred at the Elkton Division facility in the past, and no construction/modifications will be required for Navy LEAP activities. All required environmental permits and safety directives are in place. Although additional staff will be required for Navy LEAP activities, the small number of additional employees (10) compared to current personnel (504) will not be significant. As noted in Section 2.1.2, the wetlands, aquifers, and floodplains on-site will not be affected by the proposed action. Therefore, the analysis demonstrates that the proposed action will have *no significant impacts* to existing environmental conditions at the facility.

3.1.3 Boeing Aerospace and Electronics

As identified in Section 2.1.3, the Boeing facility will not require modification for the proposed action. Environmental permits and safety plans are in place. As noted in Section 2.1.3, although wetlands have been identified as areas of concern at the facility with past practices, these resources will not be affected by the Navy LEAP activities. Therefore, the analysis demonstrates that the proposed action will have *no significant impacts* to existing environmental conditions at the facility.

3.1.4 Hughes Aircraft Corporation

As identified in Section 2.1.4, Hughes Aircraft Corporation facilities in Tucson, Arizona and Canoga Park, California will not require modification for Navy LEAP activities. Environmental permits and safety programs are in place. As noted in Section 2.1.4, although both facilities operate above aquifers, these resources will not be affected by Navy LEAP activities. All hazardous/toxic materials will be handled by appropriate environmental regulations and approved facility practices. Therefore, the analysis demonstrates that the proposed action will have *no significant impacts* to existing environmental conditions at the facility.

3.1.5 Rockwell International

As identified in Section 2.1.5, Rocketdyne's facility in Canoga Park will not require modification to support Navy LEAP activities. All activities will be conducted in existing structures previously used for similar purposes. No sensitive environmental resources will be effected by

the program. Existing environmental permits and safety plans are in place to regulate activities at the facility. Therefore, the analysis demonstrates that the proposed action will have *no significant impacts* to existing environmental conditions at the facility.

3.2 Proposed Action - Site-Specific Analysis: Preflight and Flight Test Locations

This section evaluates the proposed action at the specific preflight (General Dynamics, WSMR, East Coast Navy Weapons Station, and U.S. Naval Station Roosevelt Roads) and flight test locations (AFWTF and CCAFS). Each facility was evaluated relative to environmental resources that potentially are affected by the proposed action.

The environmental resources evaluated at U.S. Naval Station Roosevelt Roads and CCAFS involved the physical setting and land use; water resources; geology and soils; biological resources; threatened and endangered species; cultural resources; air quality; noise; infrastructure; hazardous materials and wastes; and human health and safety. For each of these resource areas at these locations, potential impacts from the proposed action were evaluated separately for preflight and flight test activities. These specific environmental resources were not evaluated in Section 2.0 for General Dynamics, East Coast Navy Weapons Station, WSMR, or AFWTF.

3.2.1 General Dynamics

The preflight activities at the Pomona facility described in Section 1.2.3.1 are routine activities and will be conducted within the scope of existing environmental and safety documentation, as cited in Section 2.1.1. No sensitive environmental resources have been identified at the facility. Therefore, the analysis demonstrates that the proposed action will have *no significant impacts* to existing environmental conditions at the facility.

3.2.2 White Sands Missile Range

As noted in Section 2.2.2, preflight activities at WSMR will be within the scope of the proposed action in the STANDARD Missile EA. A finding of no significant impact (FONSI) was issued for that EA. SM activities are routinely performed at WSMR under existing environmental and safety documentation. Therefore, the proposed action will have *no significant impacts* on the natural environment or human health and safety at the installation.

3.2.3 East Coast Navy Weapons Station

Preflight activities to be conducted for the Navy LEAP Technology Demonstration will involve standard functional tests for STANDARD Missile (Configuration A) within existing facilities. East Coast Navy Weapons Station has existing facilities in which these activities are routinely conducted. Therefore, the proposed action will have *no significant impacts* to environmental resources at the East Coast Navy Weapons Station.

3.2.4 U.S. Naval Station Roosevelt Roads

3.2.4.1 Physical Setting and Land Use

Potential impacts from the proposed action to the present use of Building 380 and the Ready Service Lockers, condition of these facilities, and potential conflict with adjacent land use were evaluated. Potential impacts were evaluated with respect to preflight activities only.

Present Use and Condition - Minor modifications to Building 380 (i.e., interior electrical and air conditioning upgrades) will be required, and no modifications will be required for the Ready Service Lockers. Building 380 is used to store and process AQM's, and these missiles will be temporarily stored at the certified AQM storage magazine during fueling operations of the SM LEAP Launch Vehicle. The Ready Service Lockers are currently not being used. Therefore, activities for the preflight activities are consistent with present use.

Adjacent Land Use - Building 380 is located adjacent to an airfield, and the Ready Service Lockers are located in a "semi-improved" area that contains several other buildings (Exhibit 1.9). Therefore, the proposed action will have *no significant impacts* to adjacent land use at the installation.

3.2.4.2 Water Resources

No water resources are present at Building 380 and the Ready Service Lockers. In addition, Building 380 is located on, and surrounded by, an impervious asphalt surface; a containment system is built into the fuel cart to contain and vacuum any spills that could occur during fueling; and small quantities of propellants will be used. Therefore, the proposed action will have *no significant impacts* to water resources at the installation.

3.2.4.3 Topography, Geology, and Soils

No construction will be required for Navy LEAP activities; therefore, the proposed action will have *no significant impacts* to topography and geology. Building 380 is located on an impervious surface and the Ready Service Lockers are enclosed units. As stated in Section 3.2.4.2, small quantities of propellants will be used and if any spills occur during fueling they are easily contained by the fuel cart system. Therefore, the proposed action will have *no significant impacts* on soil resources at the installation.

3.2.4.4 Biological Resources

Neither Building 380 or the Ready Service Lockers are located in wetlands. The areas adjacent to the facilities are not habitat for terrestrial wildlife and are not covered with vegetation. Therefore, the proposed action will have *no significant impacts* on biological resources at the installation.

3.2.4.5 Threatened and Endangered Species

Activities for Navy LEAP will not occur within critical habitat of the yellow-shouldered blackbird and no activities will occur within endangered marine turtle areas at Naval Station Roosevelt Roads. Therefore, implementing the proposed action will have *no significant impacts* on threatened and endangered species at the installation.

3.2.4.6 Cultural Resources

Building 380 and the Ready Service Lockers are existing facilities in areas that have been heavily disturbed and covered by impermeable surfaces. Minor modifications to Building 380 will include electrical and air conditioning work on the interior of the building. No construction activities or further disturbances will occur at these facilities. Therefore, implementing the proposed action will have *no significant impacts* to cultural resources at the installation.

3.2.4.7 Air Quality

Fuel handling at the Ready Service Lockers and fueling activities at Building 380 will not generate air emissions. Previous LEAP analysis demonstrates that an accidental release of liquid propellants into the atmosphere is extremely unlikely. Therefore, implementing the proposed action will have *no significant impacts* on air quality. Potential program impacts from ozone depletion are discussed in Section 3.4

3.2.4.8 Noise

Preflight Navy LEAP activities at Naval Station Roosevelt Roads involve fuel handling and fueling, neither of which generates appreciable levels of noise. Therefore, implementing the proposed action will have *no significant impacts* from noise either to biological species or human health and safety.

3.2.4.9 Infrastructure

No new personnel will be added as a result of Navy LEAP activities. Adequate roads and other support services such as utilities are available. Although minor upgrades to utilities at Building 380 will be necessary, implementing the proposed action will have *no significant impacts* on infrastructure.

3.2.4.10 Hazardous Materials and Wastes

As previously cited, any spills that could occur during fueling activities at Building 380 will be contained and vacuumed by the fuel cart spill containment system, and will be disposed of by PL in accordance with applicable environmental regulations and PL standard procedures. PL will

adhere to these regulations and procedures for removal of residual propellants as well. Therefore, implementing the proposed action will have *no significant impacts* from the use of hazardous materials or generation of hazardous wastes.

3.2.4.11 Human Health and Safety

Potential hazards to human health and safety result from the handling of hazardous substances and explosive ordnance. Launch activities and launch induced noise levels also can pose risks to personnel safety. As identified in Section 1.2.7.4, range control for SM flight tests at Naval Station Roosevelt Roads/AFWTF will be provided by the AFWTF Commander. Activities will be in accordance with the Range Operations Center and AFWTF Range Safety Officer regulations and procedures. Procedures for Navy safety programs as identified in Section 1.2.7 will also apply to tests at AFWTF. As stated in Section 1.2.7.5, all activities aboard the Terrier ship must pass a series of standard tests. Handling and storage of all liquid fuels will be conducted by PL in accordance with the procedures identified in Section 1.2.7.2. Therefore, implementing the proposed action will have *no significant impacts* on human health and safety at the installation.

3.2.5 Atlantic Fleet Weapons Training Facility

Ship-board activities for Navy LEAP will be regulated under existing Navy regulations and must be approved by the Navy WSESRB prior to implementation. The Starlab EA reached a finding that sonic booms could produce a startle response in some marine birds and mammals on or above the water surface, but would not be expected to have any effect on the abundance or health of their populations (Ref #44). In addition, it has been determined that sonic booms generally do not have a significant effect on wildlife populations (Ref #44). The SM (Configuration A) and SM LEAP Launch Vehicle (Configuration B) will not be recovered from the ocean after flight tests. Although there is a potential for these missiles to injure marine organisms upon impact, due to the relatively small size of the missiles and the small number, if any, of organisms that could be injured, *no significant impacts* to marine organisms from flight tests will occur. In addition, all fuel on the missiles would be spent, which precludes impacts to the ocean from hazardous materials.

3.2.6 Cape Canaveral Air Force Station

3.2.6.1 Physical Setting and Land Use

Potential impacts from the proposed action to the present use of SLC-20, condition of this facility, and potential conflict with adjacent land uses were evaluated. Potential impacts are evaluated with respect to flight test 5 activities.

Present Use and Condition - SLC-20 was recently renovated for the Starbird project and no modifications to existing facilities will be required. This complex was specifically designed to support missile launches. Therefore, activities for flight test 5 (launch of an Aries Launch Vehicle) are consistent with present use.

Adjacent Land Use - SLC-20 is one complex within a series of launch complexes along the eastern coastline of CCAFS. Although the complexes adjacent to SLC-20 have been designated as National Historic Landmarks and are no longer active, Navy LEAP activities will not involve these National Historic Landmarks. Therefore, implementing the proposed action will have *no significant impacts* to adjacent land use.

3.2.6.2 Water Resources

Navy LEAP activities will occur within existing facilities at SLC-20 and no fueling activities will be necessary at SLC-20 for the Aries Target Launch Vehicle. Intercept of flight test 5 will occur over the open ocean within the jurisdiction of CCAFS; therefore, implementing the proposed action will have *no significant impacts* to the water resources surrounding CCAFS. As previously noted, debris from the target launch will be dispersed over open ocean.

3.2.6.3 Geology and Soils

No construction or modification of existing facilities at SLC-20 will be required. Although the Aries booster is considered a hazardous material, previous analysis for the LEAP test program demonstrates the very low probability of a catastrophic failure of the Aries Launch Vehicle, and subsequent damage to the area surrounding the launch complex. Therefore, since no activities for flight test 5 will involve soil resources, implementing the proposed action will have *no significant impacts* to the surrounding geology and soils.

3.2.6.4 Biological Resources

No wetlands are present at SLC-20. In addition, SLC-20 is not located within the 100-year floodplain. Few wildlife species are present at SLC-20. Vegetation and wildlife in the vicinity of SLC-20 would only be affected if the missile were destroyed immediately after launch. If this occurred, only a small area would be affected and would eventually become re-established. Flight test activity will not involve aquatic resources located in water resources surrounding CCAFS. The NASA Environmental Resources Document (Ref #45) concluded that no significant impacts resulted to wildlife (wading birds and bald eagles) from noise levels of 100 and 102 dBA, respectively. The Starlab EA concluded that noise generated from launch activities could cause hearing loss in individual animals and subsequently a small temporary decrease in population density. These potential impacts would be temporary. As previously stated, the debris from flight test 5 will be dispersed over the open ocean. Given the size of the dispersion area, and the size of the debris, impacts to marine biological species is extremely remote. Therefore, implementing the proposed action will have *no significant impacts* on biological resources.

3.2.6.5 Threatened and Endangered Species

The Starlab EA reached a finding that no significant impacts to threatened and endangered species would result from noise generated at SLC-20 due to launch activities. To avoid impacts to the gopher tortoise, Navy LEAP personnel will only use designated roads and will avoid

traveling/walking on beach areas. As previously stated, impacts to marine species from falling debris is very remote. The EIS for the John F. Kennedy Space Center (Ref #30) reached a finding that for threatened and endangered species, infrequent episodes of ground level exhaust effluent deposition might cause minor effects to flora but are not expected to affect adversely the fauna of the impacted areas. The LEAP EA reached a finding that for air emissions from launch activities, occurrences are sporadic, single event episodes with rapid dispersion. In addition, HCl biodegrades rapidly in the environment. Exhaust from the Aries Target Launch Vehicle will be less than exhaust levels at KSC. Therefore, implementing the proposed action will have *no significant impacts* to threatened or endangered species in the area.

If lighting is required at night for flight test activities, the Navy LEAP Technology Demonstration will adhere to CCAFS environmental policies and plans regarding lighting to avoid turtle hatchling mortality. Zest launches at SLC-20 must adhere to lighting restrictions to prevent possible diorientation or misorientation of hatchling sea turtles. The following lights have been identified at the complex:

- Pad A = 2 - 1000 watt high pressure sodium lights on 40 foot pole.
- Pad B = 2 - 1000 watt high pressure sodium lights on 40 foot pole.
- Blockhouse = 1 - 70 watt wall mounted light.
- Payload Assembly Building = 8 - 70 watt wall mounted lights.
- Security Gate = 2 150 watt lights.
- Parking Lot = 2 - 250 watt lights.

Restrictions to the use of these lights include not using the pole mounted lights at Pads A and B during the nesting and hatching period (May 1 - October 31). Only portable task oriented lights will be used in their place. Tasklights will be restricted to hand held or those on portable stands less than 8 feet tall and 250 watts or less. Light conservation must be utilized for the operation of all other lights between May 1 and October 31.

3.2.6.6 Cultural Resources

SLC-20 was considered for the National Register of Historic Places, but was determined ineligible. In the event of a catastrophic failure on the launch pad (which is very remote), the distance of over one-quarter mile and heavy ground cover separating SLC-20 from the adjacent launch complexes which are protected precludes the possible impact from debris. No modifications to SLC-20 will be required; therefore, implementing the proposed action will have *no significant impacts* to cultural resources.

3.2.6.7 Air Quality

The Starlab EA reached a finding that air pollutants emitted by combustion of solid rocket fuel would have little effect on air quality (Ref #44). In addition, the analysis in the LEAP EA demonstrates that a regular launch or a catastrophic failure of an Aries Launch Vehicle launch would not have a significant impact on air quality. Therefore, implementing the proposed action

will have *no significant impacts* to air quality. Potential program impacts on ozone depletion are discussed in Section 3.4

3.2.6.8 Noise

The LEAP EA (Ref #1) includes a finding that launched induced exterior noise levels from an Aries launch are not expected to exceed the OSHA recommended criteria limit of 115 dBA for 15 minutes. Hearing protection equipment is used during launch activities to protect program personnel positioned closer to the launch pad. In addition, noise impacts on biological resources from launches at SLC-20 have not been cited as an area of concern. Therefore, implementing the proposed action will have *no significant impacts* to human health and safety or biological resources.

3.2.6.9 Hazardous Materials and Wastes

As identified in Section 1.2.6.4, handling and disposal of all hazardous wastes will be conducted in accordance with the LEAP EA (Ref #1). The primary substances of concern in the LEAP program are the liquid fuels, which will not be stored or used at CCAFS. All ground and test activities will be conducted in accordance with CCAFS/45th Space Wing regulations and procedures. Therefore, implementing the proposed action will have *no significant impacts* from the generation of hazardous wastes at CCAFS.

3.2.6.10 Human Health and Safety

As previously stated, potential hazards to human health and safety result from the handling of hazardous and explosive substances and potential noise impacts. As identified in Section 1.2.7.4, launch and range control of the Aries Target Launch Vehicle and range control for the Aries Target Launch Vehicle and the SM LEAP Launch Vehicle will be performed by the CCAFS/45th Space Wing at Cape Canaveral. These activities will be coordinated with AFWTF. Further, Aries launches for the LEAP program have been previously conducted in accordance with the LEAP EA without incident. Therefore, implementing the proposed action will have *no significant impacts* to human health and safety at CCAFS.

3.3 No Action Alternative

As stated in Section 1.5, the No Action Alternative is not to conduct the Navy LEAP Technology Demonstration. No program flights would occur at AFWTF or CCAFS. Selection of the No Action Alternative would not result in significant impacts to the environment. However, selection of the No Action alternative would preclude the possibility of demonstrating the possibility of using Navy shipboard weapon systems with LEAP technologies for exoatmospheric flight.

3.4 Cumulative Impacts

Cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future action regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR Part 1508.7).

All government and private contractor facilities participating in the Navy LEAP test program are required to comply with Federal, state, and local regulations which guarantee the maintenance and integrity of environmental resources. These regulations include, but are not limited to the:

- National Environmental Policy Act (NEPA);
- Clean Air Act;
- Clean Water Act of 1977;
- Resource Conservation and Recovery Act of 1976;
- Toxic Substances and Control Act; and
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

Compliance with these regulations contributes to the insurance that Navy LEAP Technology Demonstration activities will not contribute to cumulative impacts on the environment.

As previously stated, implementing the proposed action will not require the construction of any new facilities. All test activities occur in facilities designed and used for activities of this nature. The Navy LEAP technology demonstration, when viewed with other LEAP program activities will not result in cumulative environmental impacts which are significant. Cumulative impacts from all these tests would include primarily impacts to air quality. These impacts, when compared to other test rocket launches, is not viewed as significant.

The programmatic and site-specific discussion of the effects on air quality from the LEAP program were presented in the LEAP EA. This discussion presented a detailed description on the potential effects of hydrogen chloride (HCl) on the environment, with the finding that HCl deposition would not lead to significant impacts from use of the LEAP projectile.

The pollutants of concern from the Aries and SM vehicles are carbon monoxide, nitrogen dioxide, particulate matter (aluminum oxide) and HCl from solid rocket propellants. The primary air quality issue associated with the Aries and STANDARD Missile launches is HCl and its potential impacts to the ozone. For the purpose of this analysis, the Aries II will be used for assessing potential air quality impacts since this vehicle contains more total propellants than the Aries I.

The impact of chlorine produced by solid rocket motors on stratospheric ozone was studied by NASA, including representatives of the NASA Goddard Institute of Space Studies and the NASA Goddard Space Flight Center (Ref. Supp EA). The study modeled the impacts of nine Space

Shuttle and six Titan IV launches per year, which comprise the largest potential source of stratospheric chlorine from the United States space fleet. This study concluded that the total annual launches would inject 0.726 kilotons of chlorine into the stratosphere, with corresponding ozone depletion less than 0.25 percent locally and less than 0.1 percent of total stratospheric ozone. The study concluded that regional or global impacts to ozone from the launches would not be significant (Ref #83).

In comparing the Space Shuttle launches to the Navy LEAP Technology Demonstration, the total weight of solid propellants on the Aries II and SM configurations would equal 14,035 pounds and 1,202 pounds (respectively), compared to the Space Shuttle's 2,218,858 pounds. The effects of the Aries and SM are addressed by scaling the available data from the largest rockets. Relative to the total weight of the solid propellant of the Space Shuttle, the amount of chlorine emitted into the stratosphere by a launch of an Aries II or SM would be anticipated to be less than 1 percent of that emitted by a single Space Shuttle launch (Ref #1). The NASA study concluded that the Space Shuttle and Titan combined launches would not have a significant impact on ozone; therefore, the localized effects from the Aries II and SM launches would be much less and more transient since these launch vehicles are considerably smaller than the Space Shuttle.

Using another model for comparison, the Strategic Target System EIS analyzed ozone depletion for boosters containing a total weight of 13,844 kilograms of solid fuel relative to the NASA study. Compared with a schedule of nine Space Shuttle and six Titan launches, it was estimated that the Strategic Target System boosters could result in an annual global ozone depletion of approximately 0.00001 to 0.0001 percent, substantially less than the Space Shuttle and Titan combined launches (0.1 percent). Although the propellants are different for the Strategic Target System and the Aries II and STANDARD Missile, the propellant weights and emissions are similar; therefore, the Aries II and SM would be anticipated to have similar annual global ozone depletion as the Strategic Target System. Because of the brief and sporadic nature of air emissions associated with Aries II and SM launches, the long-term cumulative impacts are not expected to be significant.

3.5 Relationship Between Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The Navy LEAP Technology Demonstration involves the use of existing facilities and resources. As identified in Section 1.0, private contractors involved in the program will use existing structures and facilities to support their program activities. In addition, pre-flight and flight test activities will occur at WSMR, AFWTF and CCAFS. These facilities are dedicated primarily to programs and activities of this nature; consequently, the proposed action will result in no net loss of any significant environmental resources (e.g., prime agricultural land, wetlands, historical properties) or significant amounts of natural resources.

3.6 Irreversible or Irretrievable Commitment of Resources

Implementing the proposed action will result in no impact on threatened or endangered resources, or archaeological or historic properties. In addition, the action will not result in changes in land use or cause loss of habitat for plants or animals.

Irretrievable commitment of some resources will be required to support the program. The resources would include raw materials to fabricate the various components of the launch vehicles and support systems. This commitment will be small-scale in nature, and not substantively different from similar activities carried out on a routine basis.

3.7 Conflicts with Federal, Regional, State, Local, or Indian Tribe Land Use Plans, Policies, and Controls

All activities to support the proposed action, at both private and government facilities, will occur within existing areas and structures previously used for similar purposes. All activities at private contracting facilities are in compliance with local plans and ordinances. Preflight and flight test activities will take place at existing launch facilities. Similar activities have occurred at these facilities and pose no threat to tribal land or surrounding land uses.

List of Agencies and Persons Contacted 4.0

4.0 Agencies and Persons Contacted

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Glossary and Acronyms 5.0

5.0 Glossary and Acronyms

5.1 Glossary

Advanced Solid Axial Stage (ASAS)—See ASAS Propulsion System.

Aluminum Fueled, Ammonium Perchlorate Oxidized Mixture—The ASAS solid propellant; classified as a Department of Transportation 1.3 class B explosive.

Apogee—The farthest or highest point; apex; the point of an artificial satellite or missile most distant from the earth.

Aquifers—Subsurface water-bearing strata.

ARIES I—A single-stage solid rocket booster; will serve as the target launch vehicle in the Navy LEAP Technology Demonstration.

ASAS Propulsion System—Consists of the ASAS solid propellant rocket motor for final forward boost of the LEAP projectile in the 3rd stage of the SM LEAP launch vehicle (Configuration B).

Azimuth—A distance in angular degrees in a clockwise direction from the north point.

Ballistic Missile—Any missile which does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated.

Ballast—Heavy material that is placed in the nose of the STANDARD Missile or ARIES Launch Vehicle to enhance stability and/or limit velocity and range.

Block II—Technological improvements that improve guidance, ordnance, and propulsion capability of the STANDARD Missile.

Booster—An auxiliary or initial propulsion system which travels with a missile or aircraft and which may or may not separate from the parent craft when its impulse has been delivered.

Burnout—When booster, sustainer, or ASAS impulse is delivered or expended.

Carbon dioxide (CO_2)—A colorless, odorless, incombustible gas which is a product of respiration, combustion, fermentation, decomposition and other processes, and is always present in the atmosphere.

Carbon monoxide (CO)—A colorless, odorless gas which is a by-product of the incomplete combustion of organic fuels.

Chlorofluorocarbons—A group of synthetic organic compounds composed of chlorine, fluorine, carbon, and hydrogen used primarily as industrial solvents and refrigerants.

Clam Shell Shroud—The nose cone that opens on the STANDARD Missile to enable LEAP projectile ejection on flight test 2 and subsequent missions.

Command Destruct System—Involves a flexible linear shaped charge on the ASAS and the clam-shell separation mechanism for terminating the flight of the missile. This is initiated by sending an RF tone or sequence of RF tones to the missile from the ship or range safety officer.

Configuration A—Consists of two stages: 1st stage (a MK 70 Mod 1 booster) and 2nd stage (MK 30 sustainer and missile front end).

Configuration B—Consists of four stages: 1st stage (a MK 70 mod 1 booster); 2nd stage (a MK 30 sustainer and SM autopilot battery section); 3rd stage (ASAS propulsion system, SM-2 guidance section, LEAP interface/support (LEAP interstage module), and LEAP shroud; and 4th stage (LEAP projectile).

Cultural Resources—Prehistoric and/or historic districts, sites, structures, or other physical evidence of human use considered of some importance to a culture, subculture, or community for scientific, traditional, religious, or other reasons.

Debris—The scattered remains of something broken or destroyed.

Decibel—Standard unit for sound measurement and represents the acoustical energy present in the environment.

Dispersion—A scattered pattern of hits around the mean point of impact of bombs and projectiles dropped or fired under identical conditions.

Dual Redundant System—See Flight Termination System (FTS).

Endangered Species—A species that is threatened with extinction throughout all or a significant portion of its range.

Environmental Telepak—Measures the launch environment (temperature, shock, vibration) for the LEAP projectile.

Explosive Safety Quantity-Distance—The quantity of explosives material and distance separation relationships providing defined types of protection. These relationships are based on levels of risk considered acceptable for the stipulated exposures.

Fire Control System—A group of interrelated fire control equipment and/or instruments designed for use with a weapon or group of weapons.

Flight Test—Test of an aircraft, rocket, missile, or other vehicle by actual flight or launching.

Flight Termination System (FTS)—A flight safety measure added to the ASAS motor that will be a dual, redundant system which is capable of terminating the ASAS thrust and destablizing the flight of the STANDARD Missile and LEAP.

Floodplain—A plain along a river formed by the combination of the deposition on alluvial materials and downcutting of surface geology through flooding.

Fuel Carts—Used to transfer fuels from HOKE bottles to the LEAP projectiles. It contains all necessary storage, liquid transfer, and safety systems for transporting the liquid propellants, and consists of a pressurization system (helium or nitrogen), a propellant scale, manifolding and valves used to regulate flow, and a stainless steel propellant transfer bottle.

Halon—A group of synthetic organic compounds composed of fluorine and other halogens (e..,g bromine, carbon, and hydrogen) used primarily as fire suppressant agents.

Hazard Class/Division—A numerical designator which is assigned to denote that a material is either explosive or poisonous (toxic). The numerical designator 1 identifies explosives, whereas 6 identifies poisonous (toxic) material. The hazard division is also a numerical designator that is assigned to devote the character and predominance of the associated hazards and the potential for causing personnel casualties or property damage. Within hazard class 1 (explosives), there are five divisions which indicate the type of hazards expected:

1.1 Mass explosion
1.2 Non-mass explosion, Fragment producing
1.3 Mass fire, minor blast, or fragment
1.4 Moderate fire, no blast, or fragment
1.5 Explosive substance, mass explosion, or Ammunition article, unit risk

Within hazard class 6, only one division is utilized for ammunition - division 1, which devotes poisonous (toxic) substances.

Hydrazine (N_2H_4)—A colorless, fuming, corrosive hygroscopic (moisture absorbing) liquid used in jet and rocket fuels; a potential fuel for LEAP.

Hypergolic Fuel—Fuel which will spontaneously ignite with an oxidizer.

Impact—An assessment of the meaning of changes in all attributes being studied for a given resource; an aggregation of all the adverse effects, usually measured by a qualitative and nominally subjective technique.

Kinetic Energy—Energy associated with motion, equal for a body in pure translational motion at nonrelativistic speeds to one half the product of its mass and the square of its speed ($K = 1/2\ m\ V^2$).

Kinetic Kill Vehicle Test Support—Capability of the range to provide adequate facilities and equipment necessary to handle the STANDARD Missile launch vehicle; to transport and store liquid fuel and oxidizer; to fuel the LEAP projectile; and launch the SM launch vehicle.

Launch Scheduling—Potential for scheduling conflicts between existing range uses/test programs and requirement of the Navy LEAP Technology Demonstration. Also, ability to support proposed Navy LEAP flight test schedules

LEAP Auxiliary Equipment (LAE)—Additional equipment such as handling fixtures, cryogas supplies and electrical interface units used to either assist in LEAP vehicle integration and checkout or to provide additional interface or life support aboard the SM.

LEAP Launch Vehicle—This vehicle is the STANDARD Missile used for launching the LEAP projectile in the Navy LEAP Technology Demonstration, .

Lightweight Exoatmoshperic Projectile (LEAP)—The miniature integrated interceptor developed by SDIO to serve as a technology demonstrator for intercepting ballistic missile-type targets. The 10 Kg class LEAPs use on-board target detection, tracking, and maneuvering capabilities to intercept and destroy their targets by direct impact (kinetic energy) with the warhead.

Liquid Bipropellants—See Propellant; The propellants for LEAP consist of hydrazine or monomethylhydrazine as the fuel, and nitrogen tetroxide as the oxidizer.

Loam—A soil composed of a mixture of clay, silt, sand, and organic matter.

Mitigation—A method or action to reduce or eliminate adverse environmental impacts.

Monomethylhydrazine (MMH)—A potential fuel for LEAP.

National Ambient Air Quality Standards—Standards established on a Federal level that define the limits for airborne concentration of designated "criteria" pollutants to project public health with an adequate margin of safety (primary standards) and to project public welfare, including plant and animal life, visibility, and materials (secondary standards) Standards cover ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulates, and hydrocarbons.

Nitrogen tetroxide (N_2O_4)—A dark brown, fuming liquid or gas with a pungent, acrid odor, used in rocket fuels; the oxidizer for LEAP.

Ordnance—Explosives, chemicals, pyrotechnic and similar stores, e.g., bombs, guns and ammunition, flares, smoke, napalm.

Oxidize—To combine with oxygen; make into an oxide.

Oxidizer—A substance that oxidizes or induces another substance to oxidize.

Ozone (O_3)—A highly reactive form of oxygen that is the predominant component of photochemical smog. Ozone is not emitted directly into the atmosphere but results from a series of chemical reactions between oxidant precursors (nitrogen oxides and volatile organic compounds) in the presence of sunlight.

Playa—A nearly level area at the bottom of a desert basin, sometimes temporarily covered with water.

Propellant—That source which provides the energy required for propelling a projectile. Specifically, a fuel, either solid or liquid, for propelling a rocket or missile.

Propellant Decontamination and Neutralization System (PDNS)—Works in conjunction with the fuel carts and uses water to dilute residual propellants.

Proven Technology—Technology which has been shown to perform as expected or within accepted bounds as determined by experimentation.

Radome—A domelike protective housing for a Radio Frequency antenna.

"Ready Room"—The location on the Terrier ship for locating projectile support equipment (e.g. test and checkout and pressurization "carts"). Final SM2 integration and check-out is done here.

Scenario Realism—Whether or not the range (in conjunction with nearby ranges if necessary) can support launch of a target and LEAP launch vehicle in a manner that is representative of a realistic engagement scenario.

Solid Divert Propellant—An alternative propulsion system for LEAP; being developed by Thiokol Corporation, Tactical Operations, Elkton Division; does not involve pressurization and is clean-burning and non-toxic.

Shipboard Weapon Systems—Any type of weapons systems (i.e., surface-to-air ship launched missile systems) in a mobile (ship-based) environment.

STANDARD Missile (SM)—A supersonic, solid-rocket propelled, tail-controlled missile. It is deployed by the Navy, primarily as a surface-to-air ship-launched missile for defense against attacking aircraft and anti-ship missiles.

SM-2 Block II ER—An improved version of the STANDARD Missile used as the LEAP launch vehicle.

Storage Compatibility Group—In view of storage principles, ammunition and explosives are assigned the appropriate one of 12 storage compatibility groups (A through H, J, K, L, and S).

Storage Compatibility Group B—Detonators and similar initiating devices. Items containing initiating explosives that are designed to initiate or continue the functioning of an explosive train. Examples are detonators, blasting caps, small arms primers, and fuzes without two or more safety features.

Surface-to-Air Missile—A surface-launched missile designed to operate against a target above the surface.

Sustainer—The second stage rocket motor used on the SM-2 Block II ER during the midcourse guidance phase. This motor buns longer than the booster at a lower thrust level.

Threatened Species—Species likely to become endangered in the foreseeable future.

Tracking, Control, and Telemetry Requirement—Capability of the range to provide adequate tracking, control, and telemetry support.

Target Support—Whether or not the range can support launch and control of an acceptable target vehicle.

Tartar—A shipborne, surface-to-air missile system similar to Terrier with solid-propellant rocket engine and non-nuclear warhead.

Telemetry—The science and technology of automatic measurement and transmission of data from remote sources, as from space vehicles, to a receiving station for recording and analysis.

Terrier ship - A guided missile cruiser or destroyer equipped with a Terrier missile system.

3-Sigma Dispersion Area—Area over which debris is disbursed in which the probability of all the debris being contained within the boundaries is greater than 97% based on a normal distribution.

Trajectories—The flight paths of moving objects.

Terrier—A surface-to-air missile system with solid-fuel rocket motors. It is equipped with radar beam rider or homing guidance and non-nuclear warhead.

Thrust Vector Control (TVC) System—Located in the 3rd stage of Configuration B of the STANDARD Missile and is used to control the direction of ASAS thrust.

Wetlands—Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

5.2 Acronyms

ABM	Anti-Ballistic Missile
ACHP	Advisory Council on Historic Preservation
ACS	Attitude Control System
AFB	Air Force Base
AFWTF	Atlantic Fleet Weapons Training Facility
AICUZ	Air Installation Compatible Use Zone
Al	Aluminum
ALFA	Military nomenclature. Designation for Northern Range at AFWTF
AMC	Air Mobility Command
AP	Ammonium Perchlorate
AQCR	Air Quality Control Region
AQM	A (Air launched) Q (Special) M (Missile)
ARIA	Advanced Range Instrumentation Aircraft
ASAS	Advanced Solid Axial Stage
ATBM	Anti-Tactical Ballistic Missile
BAE	Boeing Aerospace & Electronics Company
BOE	Bureau of Explosives
BMO	Ballistic Missile Operations
BP	Brilliant Pebbles
CAA	Clean Air Act
CARIB	Caribbean
CCAFS	Cape Canaveral Air Force Station
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CG	Center-of-Gravity
CONUS	Continental United States
dBA	Decibels (A-weighted)
DoD	Department of Defense
DOPAA	Description of Proposed Action and Alternatives
DOT	Department of Transportation
EA	Environmental Assessment
EOD	Explosive Ordnance Division
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
ER	Extended Range
ESMC	Eastern Space and Missile Center
ESMCR	Eastern Space and Missile Center Regulation
FAA	Federal Aviation Administration
FTS	Flight Termination System
FY	Fiscal Year
GHe	Gaseous Helium

GMLS	Guided Missile Launching System
GN_2	Gaseous Nitrogen
GPS	Global Positioning System
HAC	Hughes Aircraft Company
HALO	High Altitude Learjet Observatory
Hcl	Hydrogen Chloride
HEDI	High Endoatmospheric Defense Interceptor
HTPB/AP	Hydroxy-terminated Polybutadiene/Ammonium Perchlorate
IMU	Inertial Measuring Unit
IR	Infrared
KKV	Kinetic Kill Vehicle
KMR	Kwajalein Missile Range
KSC	Kennedy Space Center
KTF	Kauai Test Facility
LAE	LEAP Auxiliary Equipment
LC	Launch Complex
LEAP	Lightweight Exoatmospheric Projectile
MAB	Missile Assembly Building
MAF	Missile Assembly Facility
MIL-STD	Military Standard
MIT/LL	Massachusetts Institute of Technology/Lincoln Laboratories
MK	Navy nomenclature. Navy equipment identifier prefix
MMH	Monomethylhydrazine
MOTR	Multi-Object Tracking Radar
MR	Medium Range
N_2H_4	Hydrazine
N_2O_4	Nitrogen Tetroxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NAVLO	Naval Liaison Officer
NEPA	National Environmental Policy Act
NOMTS	Naval Ordnance Missile Test Station
NPL	National Priorities List
NRHP	National Register of Historic Places
OSHA	Occupation Safety and Health Administration
PAB	Payload Assembly Building
PCB	Polychlorinated Biphenyl
PDNS	Propellant Decontamination and Neutralization System
PL	Phillips Laboratory
PM 10	Suspended particulates less than 10 microns in diameter
PMOA	Programmatic Memorandum of Agreement
PMRF	Pacific Missile Range Facility
PMTC	Pacific Missile Test Center
POL	Petroleum Oil and Lubricant

RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
ROC	Range Operations Center
ROCC	Range Operations and Control Center
RSO	Range Safety Officer
SC	South Carolina
SDIO	Strategic Defense Initiative Organization
SDS	Strategic Defense System
SFAE	Identifies BMD Payload Product Office
SLC	Space Launch Complex
SM	STANDARD Missile
SSC	Species of Special Concern
SSOPs	Standard Safety Operating Procedures
STARS	Strategic Target System
STP	Space Test Projectile
TECOM	Test and evaluation Command
TLV	Target Launch Vehicle
TMD	Theater Missile Defense
TOPs	Technical Operations Proccdures
TPS	Translator Processing System
TVC	Thrust Vector Control
ug/m^3	Micrograms per cubic meter
US	United States
USACOE	United States Army Corps of Engineers
USASDC	United States Army Strategic Defense Command
USFWS	United States Fish and Wildlife Service
VAFB	Vandenberg Air Force Base
VLS	Vertical Launch Ship
WFF	Wallops Flight Facility
WSESRB	Weapons Systems Explosive Safety Review Board
WSMR	White Sands Missile Range
WSTF	White Sands Test Facility

List of References 6.0

6.0 Reference List

The purpose of the reference list is to provide a list of documents used in describing and analyzing the proposed action and alternatives. The reference list is indexed chronologically rather than alphabetically. The reference number is used throughout the document similar to endnotes.

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